Verification Team Report  
December 11, 2009

A. Identification of Program: Chemistry  
Program Evaluation & Planning Team members: Steve Fawl, Forest Quinlan, Martin Murphy  
Verification Team Members: Jenny Sercu, Jeff Wachsmuth, Cari Roughley

B. Status of Curriculum Revision  
- As of Fall 2009, seven courses have been revised within the past 5 years without substantive changes.  
- An additional course, CHEM 105, was written, submitted and approved in Fall 2008

C. Statement of Completion  
The Chemistry Program Evaluation & Planning Report (PEPR) is complete and accurate. The report contains and addresses all of the applicable elements. Program updates were verified and all schedules were attached.

D. Strengths of the Program  
- The faculty are performing at a high standard  
- The program serves an important role in the Napa Valley College (NVC) community and contributes to many NVC degrees and certificates.  
- The department is actively involved in using new approaches to meet student needs, including supplemental instruction. The department uses technology effectively and appropriately.  
- The program is highly productive with large class sizes and high demand for classes. Completion rates for Chemistry courses might appear low by NVC standards, but they are nationally appropriate for Chemistry courses.  
- The department is actively participating in the SLO Assessment pilot program.

E. Areas for Program Improvement  
- Chemistry classes should offer more courses at more convenient times, ie: evening and summer courses.  
- Updated equipment and books are needed and essential for the department to maintain its effectiveness and high standards.  
- An increase in the program budget from $6000 to $8000 is necessary to properly maintain equipment and re-supply chemicals.  
- Follow through with the Physical Science Refurbishing Project to bring the facility into ADA compliance and meet current safety standards.  
- Purchase additional equipment to meet the recommended standards set by the American Chemistry Society.  
- Offer CHEM 121 during summer semesters to minimize the timeframe between taking the CHEM 120, 121, and 241 sequence.
F. Summary of Verification Team Recommendations

The Chemistry Department plays a very important role in the education of NVC students and has done a tremendous amount of work to reach and maintain the current level of high academic standards. Students are very well prepared for subsequent science courses at NVC and universities. The verification team supports the ongoing efforts by the Chemistry faculty.

The team strongly supports the request for a replacement Chemistry IA upon the [leaving] of the current IA to attend medical school. We also support the request for funding for equipment, books, and improved storage facilities for classes taught outside of the main NVC campus.

Although the quality of instruction is superb, the Verification team supports the recommendation for Chemistry Instructors to attend the Great Teachers Seminar to improve/add variety to their teaching methods.

The team questions whether funding for an additional full-time Chemistry instructor is necessary at this time, given that increase in sections and courses have yet to be approved. However, if sections and courses are added, then a full-time instructor would be justified.

Addition of one full-time faculty member to teach CHEM 105 and CHEM 242, in addition to other CHEM courses.
Instructional Program Evaluation
Part 1

Program: CHEMISTRY
Date: FALL 2009

1. Mission

A. Program Mission Statement
   This section should be a short, clearly stated purpose of the program or services. In other words, what does the program/service/department contribute to Napa Valley College’s (NVC) Mission. Write or revise your program mission statement in the space below. The NVC Mission is provided for reference.

   The mission of the Chemistry Department is to educate students in the principles, concepts, and methods of chemistry, facilitate the understanding of chemical processes, promote recognition of the role of chemistry in everyday life, and empower students with the scientific knowledge and technical skills that enable them to be influential members of society.

B. The program falls within one or more of the following categories (check all that apply):

   X Transfer/Degree
   ☐ Vocational
   ☐ Remediation
   ☐ Non-Credit/Community Services

2. Accreditation and External Reviews

A. Review NVC’s Accreditation Planning Summary (available on the PEP website “Documents”) and results of previous program evaluations. Discuss the recommendations of the review teams relevant to the program and how the program responded.

   Not Applicable

B. Indicate the sources of information used in Question 2.A.

   ☐ Accreditation Self-Study Planning Agenda
   ☐ Accreditation Final Report
   ☐ Previous program evaluation recommendations

   Not Applicable
C. Review the recommendations from any other licensing or accreditation bodies. Discuss the recommendations of the review teams relevant to the program and how the program responded.

Not Applicable

D. Reflect on your responses in Section 2. Accreditation and External Reviews and write objectives for improvement on Schedule A. Program/Discipline Plan.

Not Applicable

3. Curriculum and Instruction

A. Prepare/revise the Student Learning Outcomes Matrix.

See attached Student Learning Outcomes and SLO Matrix.

B. Review the course outlines of record.
1) Assess the appropriateness of the degree and certificate requirements.

The Chemistry faculty have reviewed the requirements and find them appropriate.

2) Evaluate the appropriateness of courses to the program.

The Chemistry faculty have reviewed the courses and find them appropriate.

3) Assess the appropriateness of current pre- and co-requisites and recommended preparation. Have the pre- and co-requisites been validated through the NVC curriculum process?

The Chemistry faculty have reviewed the pre- and co-requisites and find them appropriate. All have been validated through the NVC curriculum process.

4) Determine which course outlines have not been updated since the last program evaluation or within the past five years.

See attached Curriculum Action Plan.

5) Write SLOs for the program and for each course.

SLOs are included in the syllabi for all of our courses. By 2009-2010, the syllabi will be posted on instructor websites.
C. If you have not developed or revised program SLOs and course outlines for every course in your program, complete the Curriculum Action Plan. Follow the directions provided by the Curriculum Committee.

See attached Curriculum Action Plan.

D. Describe how your program ensures that the syllabi for each instructor are congruent with the course outline. Describe what measures are taken if any syllabi are incongruent with the course outline.

We have assigned full-time instructors to oversee each course. All syllabi have course outlines taken directly from the course outline of record. The syllabi of part-time instructors are reviewed by full-time instructor(s) prior to the beginning of each semester to ensure that the syllabi conform to the COR.

E. Assess Student Learning Outcomes

1) Explain the methods used to assess student learning outcomes. Describe which student performances were assessed and where the assessment occurred (please be specific).

Student learning outcomes are assessed through a combination of written exams, laboratory reports, written assignments, and quizzes. The Chemistry Department is participating in the SLO Pilot Assessment Program and has developed an SLO Rubric to be used by all instructors teaching Chemistry 110 (see attached). By the end of 2010, it is anticipated that similar Rubrics will be developed for all the chemistry courses offered.

2) Summarize your findings from the data.

Not applicable. Data have not yet been collected. We will collect and analyze data during 2009-2010.

3) Describe how you used the data and the results to improve teaching and student learning?

Not applicable. Data have not yet been collected. We will collect and analyze data during 2009-2010.
4) An accreditation standard requires that the institution makes public expected learning outcomes for its degree and certificate programs. In what ways are the program’s expected learning outcomes made public? Check all that apply:

- [X] Syllabi
- [ ] Catalog
- [ ] Brochure
- [ ] Articulation/Transfer agreements
- [X] Website
- [X] Other: Currently, SLOs are included in the syllabi for all our courses. By 2009-2010, the syllabi will be posted on instructor websites. All full-time Chemistry faculty have developed websites.

F. Instructional Methods

1) Discuss the methods used by the program to ensure that similar standards of academic rigor of the course outline of record are followed by all instructors in the discipline?

The full-time Chemistry faculty meet on a regular basis to discuss course content and assessment to ensure that similar standards are maintained throughout the curriculum, and that courses in a sequence build knowledge in a logical fashion. Instructors that teach the same course communicate regularly to compare notes on topics covered, depth, and rigor of examinations and assessment.

2) Discuss the instructional methods used by the program faculty to address the diverse student population and to encourage retention and persistence?

We treat each student as an individual and adapt our teaching approaches as necessary to meet individual student needs. We provide evening instruction for students who work during the day. We also provide programs such as Supplemental Instruction (SI) and Academic Excellence Workshops (AEW’s) to provide additional resources, tutoring, and study times to help meet diverse student needs.

3) Discuss the instructional methods used by the program faculty to address the differences in learning styles and to encourage retention and persistence?

We employ a wide variety of pedagogical methods, including lectures, visual presentations, kinesthetic activities during lab, and one-on-one student interaction to address different learning styles. Critical to this is the use of molecular models, videos, computer-based learning tools for the visual and kinesthetic learners.

G. On-line Services

1) List the on-line and hybrid courses that are offered in this program.

None
2) Is 50% or more of the program offered through a mode of distance or electronic delivery? Yes____ No__ X____

3) Discuss the program’s plans for future on-line offerings. There are no plans for online offerings at this time.

4) Describe any challenges that have been identified and needs that must be addressed to support the development of on-line offerings.

If an online course in Chemistry were offered, the students would be required to attend six hours of lab per week. As a consequence, an online course in Chemistry is not being considered.

H. Review existing articulation agreements with high schools and other colleges. Are they adequate? Current? Effective? If not, what changes will be made?

In the Fall of 2009, the Chemistry department completed the Lower Division Transfer Pattern agreement with CSU’s. Compliance with the LDTP assures articulation between Chemistry and all CSU’s. In addition, in the past year the Chemistry Department has worked closely with the NVC Articulation Officer to renew its articulation agreements with UC’s. Also, the Chemistry Department teaches chemistry at New Tech High School, thus assuring that students taking this class will receive college credit. The existing articulation agreements are current and effective. No changes are required.

I. Reflect on your responses in Section 3. Curriculum and Instruction, and write objectives for improvement on Schedule A.

See attached Schedule A.

4. Community Outreach and Articulation

A. Off-Campus Offerings

1) List the off-campus courses offered in the program and the location (Upper Valley Campus, American Canyon/South County, other/identify).

The Chemistry Department offers CHEM 110 at the Up-Valley campus at St. Helena in the Fall and Spring semesters. We also offer CHEM 110 in Fall and CHEM 111 in Spring at New Tech High School in Napa.

2) Discuss the program’s plans for future off-campus offerings.

None at this time.
3) Describe any identified challenges and needs that must be addressed to support off-campus offerings.

The need for chemical supplies and storage presents challenges in transport and security. The Department of Transportation regulates the transport of chemicals and guards the public safety. Moving chemicals back and forth between the main campus and UVC has been problematic and a point of discussion in the Chemistry department. New Tech High School cannot offer a secure, chemically compliant cabinet for storage so there is no plan for offering Chemistry lab courses at the school and in-class demonstrations are limited because of transportation and logistic issues. We are currently in communication with the principal of New Tech High School to address this issue. It is important to note that remote sites do not have qualified personnel to deal with leaks or spills in the absence of Chemistry personnel, and multidisciplinary lab spaces have the potential to produce hazard spills without the advantage of qualified personnel. Careful enrollment caps have been instated at the Up-Valley campus to ensure student safety and quality instruction.

B. What recruitment and/or community outreach activities has the program engaged in or initiated?

The Chemistry faculty are actively involved in the NVC MESA program and Dr. Quinlan is serving as club advisor. Chemistry faculty actively participates in twice yearly MESA Fairs. The offering of classes at New Tech High School allows for active recruitment among the high school students and the advantages of attending NVC after graduation is regularly discussed.

C. What has the program done to establish relationships with secondary schools and/or four-year institutions?

The Chemistry Department has an excellent working relationship with New Tech High School in Napa and provides two classes on their campus. In addition the Chemistry faculty maintains working relationships with the faculty of UC Davis, Chico State University, University of Washington, Stanford, and community colleges around the state.

D. What has the program done to establish relationships with the business community (if a vocational program)?

The Chemistry Department maintains active relationships with various members of the business community. Some of these business members come to campus and provide information and demonstrations to our students. Others provide much needed supplies of surplus equipment and chemicals. At various times we have had agreements with Mare Island, Dey Labs, and Cal-Test to train their personnel and students in the specific needs of these companies.
E. How has the involvement of the advisory committee helped in improving and/or promoting the program (vocational programs only)?

We have not requested the involvement of the advisory committee.

F. Reflect on your responses in Section 4. Community Outreach and Articulation and write objectives for improvement on Schedule A.

See attached Schedule A.

Reviews and Signatures

Part I of the program evaluation report is to be reviewed by the program faculty or staff, signed by the program evaluation chair and division chair or supervisor, and forwarded to the Office of Research, Planning and Development by May 1.

| Program Evaluation Chair Signature: ______________________________ |
| Division Chair/Supervisor Signature: ______________________________ |
| Date: ______________________________ |
5. Enrollment Trends and Student Satisfaction

A. Review the enrollment trends data, and describe recent trends. Are there external factors such as community demographics or the economy that have affected the program? What are the plans to address these factors?

In 2004 the Chemistry department went through a dramatic change. One of our faculty members retired who specialized in teaching CHEM 110. At that time four sections of CHEM 110 were taught – three by our full time faculty and one by an adjunct instructor (sections in chemistry are measured by the number of labs sections, not instructors or class sections). When this full time faculty member retired the remaining senior member of our department immediately added one more section of CHEM 110 and continued to add more sections each year until, by 2008, as many as 11 lab sections were in the schedule and were taught by as many as five adjunct instructors. In addition, an extra section of CHEM 240/241 had also been added to the schedule.

While the intent of the addition of these sections was to make these classes more available to students, the result did not increase enrollment. Instead, it merely decreased the class size for each section and, in some cases, forced the closure of under-enrolled classes. Despite there being more sections available, students did not enroll in these classes, in fact there was a 17.5% decline in enrollment over this period of time even though the college was seeing a 12.8% increase in overall enrollment.

There are a number of reasons why enrollment has dropped in Chemistry. We were advised to have our new faculty members teach no more than 15 hours per week. Unfortunately, their loads included classes with multiple sections, so in order to comply with this request; sections had to be cut which further reduced our enrollment numbers.

In addition, in anticipation of student drops, it had been the practice of our instructors to over enroll their classes. In most classes, this has little consequence, but in Chemistry this also over enrolls our labs which set up a potential hazard to the health and safety of our students. Therefore, over enrollment is no longer allowed. Although our labs are now much safer, this new mandate has forced a further decline in our enrollment.

Enrollment also dropped as a consequence of the CAP placed on enrollment. The State of California only funds the education of students to a preset maximum enrollment (CAP). Enrolled students beyond this CAP are not funded by the State. Napa Valley College is already enrolled beyond this CAP and as a consequence we have been told that we cannot add any more sections or over-enroll our courses. This has set an arbitrary limit on the number of sections we are allowed to offer in Chemistry and it limits the number of students we can add to our classes. Unfortunately, despite the demonstrated need for more sections
of Chemistry, the enrollment CAP does not allow us to add back the sections we had closed a couple of years earlier.

Finally, it is believed that the lower enrollment was partly due to the poor quality of instruction provided by many of our adjunct instructors from 2004 to 2007. Students were not enrolling in some sections because the quality of education was lacking.

When the most recent senior chemistry faculty member retired, the enrollment strategy for the chemistry department was reevaluated (2008). Under-enrolled sections of CHEM 110 and CHEM 111 were dropped from the schedule as was the second offering of Organic Chemistry (CHEM 240/241). This is reflected in the data that shows a drop in enrollment in these classes between 2006-2007 and 2008-2009. The adjunct pool was trimmed back from five down to two and the number of sections dropped from ten down to eight (2009). Careful attention was paid to the quality of instruction. As a consequence the remaining sections are now full with waiting lists and, according to our CHEM PEP Survey, the students are generally well pleased with the quality of instruction.

We are now in a position where we should consider slowly increasing the number of sections. Unfortunately, despite the demonstrated need for more sections of Chemistry, the enrollment CAP does not allow us to add back the sections we had closed a couple of years earlier. As you may know, the State of California only funds the education of students to a preset maximum enrollment (CAP). Enrolled students beyond this CAP are not funded by the State. Napa Valley College is already enrolled beyond this CAP and as a consequence we have been told that we cannot add any more sections or over-enroll our courses. This has set an arbitrary limit on the number of sections we are allowed to offer in Chemistry and it limits the number of students we can add to our classes.

Two things must be done to reverse this trend. We must be allowed to increase the number of sections offered in Chemistry. Also, we must be allowed to restore the sections lost by having our new full time faculty teach an overload. The enrollment numbers and long waiting lists justify this decision.

B. Review the load (WSCH/FTEF), productivity (FTES/FTEF), average class size and financial data and describe recent trends.

In the past year and half the Chemistry department has closed under-performing sections, limited the hours taught by new full time faculty, and limited class size due to lab safety issues. As a consequence our productivity has declined from 18.80 FTES/FTEF in 2005-2006 to 15.98 FTES/FTEF in 2008-2009. But it should be noted that despite this decline the Chemistry department is still more productive than the campus average of 13.56 FTES/FTEF for 2008-2009 and all other reported years. In 2005-2006 the Chemistry department’s average load was 563.85 WSCH/FTEF and this has dropped to 479.43 WSCH/FTEF in 2008-2009 but we still exceed the campus norm of 406.75 WSCH/FTEF for 2008-2009 and all other reported years.

Not surprisingly, the average class size in Chemistry has shown a similar decline from 44.5 students per section in 2005 to 38.1 students per section in 2009 - a decline of 16.8%. But, Chemistry still exceeds the campus norm of 26.5 students per section by nearly 44%.
The decline in enrollment and class size is due almost exclusively to a decision by the Chemistry department to limit enrollment based on laboratory safety issues. We can accommodate more students if additional sections of Chemistry are allowed to open but our class size cannot increase without refurbishment and expansion of our current facility. The facilities plan includes the refurbishment and enlargement of existing labs and the creation of one additional lab. These new labs will have enough space for 32-36 students rather than the 24 student limit of our current labs. Until these new labs are in place our current class size cannot increase, but we can add more sections of Chemistry to accommodate the increased need for Chemistry classes.

Overall, despite a decision to decrease enrollment due to laboratory health and safety issues, the Chemistry department still exceeds the campus wide norm in load, productivity, and class size.

C. Review the program’s schedule of classes and the student satisfaction survey results. Discuss whether the courses are scheduled appropriately to meet student needs.

Based on the student satisfaction survey students would like to see more classes offered more often, and at more convenient times – including night classes and summer school. Specifically, students would like to see the more advanced classes in General and Organic Chemistry offered at night or during the summer or at other times during the day. As with all departments and divisions on our campus, careful consideration is given to our schedule. We must block out our classes in such a way that we optimize participation and minimize the impact on the other classes a student wants to take. The SME division has allocated certain time slots for each of our disciplines to assure a student’s ability to fill their schedule with a minimum of conflicts. Certain time slots have high classroom usage across our campus. As it is now, we cannot add a class or change a class to one of these more convenient time slots because there are no additional classrooms available in which to teach. In addition, our courses also have a lab component so we must schedule our classes in such a way that our labs are available when needed.

The Chemistry department is sympathetic to the needs of its students, but the vagaries of scheduling and classroom availability inhibit our ability to offer classes at times when students might deem them to be more convenient.

The student survey brought attention to the need for additional offerings in some of the more advanced classes. In particular, there is only one class of Organic Chemistry. If a student cannot take it in the Fall they must wait an entire year to begin the series. The existing class is now large enough, and demand has increased to the point where a second, off semester offering might be viable. In addition, none of our more advanced chemistry classes are taught during the summer. We should consider a summer offering of CHEM 121 so that students taking CHEM 120 in the spring could continue the class during the summer and be prepared for Organic Chemistry in the Fall. Otherwise these same students take CHEM 120 in the Spring, CHEM 121 the next Fall, and then wait until the following Fall to begin the Organic Chemistry series. Adding an off semester Organic Chemistry class or a summer session of CHEM 121 provides a way for these students to continue their education in a more expeditious way.
Another way of mitigating the scheduling problem is to offer more advanced classes at night. The Chemistry department has never offered a CHEM 120/121/240/241 class at night and this might be a way of making these classes more available to our students. There is lab space available at these times but it is unknown whether a night offering would draw a sufficient number of students to warrant putting it into the schedule.

D. Discuss the results of the student satisfaction survey, identifying areas for improvement and continued success.

Based on the results of the student survey, our students are generally pleased with the quality of instruction they are receiving. Several instructors are mentioned by name as providing excellent instruction. The general quality of instruction across our curriculum has become more uniform due to the addition of two new faculty members. Students are better prepared for advanced Chemistry classes and it has been noted by our colleagues that our students are better prepared for their science classes than the norms of years past. In addition, anecdotally, students have come back from various universities and report that they have been better prepared than the students taking the classes elsewhere. By these measures, the Chemistry program has been highly successful and hopes to continue and improve on that success.

Review of the student survey shows that when dissatisfaction with the Chemistry program is identified, students suggest a greater use of technology, group work, more in-depth explanations, exam reviews and hand outs as ways of improving the class. Instruction will be improved if these suggestions are implemented and instructors will be encouraged to do so.

From the survey, it is clear that the students are much happier with some instructors than with others. When dissatisfaction is noted, the students suggest other forms of instructional delivery as a way of mitigating the problem. Adding these methods improves the quality of instruction, but it does nothing to improve the quality of the instructor. To this end, it is suggested that our instructors attend the “Great Teachers Seminar” to help improve their teaching methods. In addition, the Chemistry faculty should begin having regular meetings to discuss pedagogy and take a look at successful “best practices” with the goal of improving both the instructor and instruction.

E. What documented labor market demand does this program address? Does the program offer unique training (and not represent unnecessary duplication of manpower training) in the area? (vocational programs only)

Not Applicable

F. Reflect on your responses to Section 6. Enrollment Trends and Student Satisfaction, and write objectives for improvement on Schedule A.

See attached Schedule A.

Approved: ___________________________ Date_________

Director, Institutional Research
6. Student Success and Equity

A. Review the data on enrollment, retention, and successful course completion. Discuss program trends relative to college-wide and course level trends. Identify areas where disparity exists for any demographic group (race/ethnicity, gender, age, disability)

(1) Retention & Successful Course Completion among Courses & Across Program

In three of the last four years, the Chemistry program claimed a higher successful completion rate than the college as a whole. In 2008-2009 the Chemistry program was lower than the rest of the college due primarily to one course, CHEM 111 that had a successful completion rate of just 48%. If this class is excluded, the rest of the Chemistry program claimed a successful completion rate of 71.1% as compared to 70.9% for the rest of the college. While the completion rates in CHEM 111 and CHEM 240 are consistently lower than the rest of the Chemistry program, a 48% completion rate for CHEM 111 in 2008-2009 is thought to be a statistical aberration and is being monitored by the Chemistry faculty.

As discussed above, in the past two years the data indicates that two of our Organic Chemistry courses, CHEM 111 and CHEM 240 have lower completion rates than other Chemistry courses. This was due to a change in the personnel teaching these classes. The students are now held to a higher standard than before and the course completion rate has fallen as a consequence. Even so, the new levels of completion are in alignment with national standards for these two classes. Traditionally, Organic Chemistry is used as a measure of a student’s potential success at Medical School and other difficult medical and science related specialties. Nationally, Organic Chemistry has the lowest success rate of any of the Chemistry classes. In a study done by Dr. Jack A. Kampmeier at the University of Rochester, “one-quarter to one-half of beginning organic students don’t do well enough to continue on to the next course.” He reports that the average success rate at Rochester is 66% for traditional lecture/recitation class in Organic Chemistry (C&EN, April 16, 2001, Volume 79, Number 16 pp.42-43). Given the nature of the subject, the Chemistry faculty concludes that the success rates in Organic Chemistry at Napa Valley College are on a par with, or better than, national norms and these classes should not be compared to other, less rigorous classes in chemistry.

(2) Enrollment by Equity Group

The following groups claimed a significantly smaller proportion of enrollments in CHEM than they did in NVC credit programs as a whole:

- 2006-2007: African Americans, Native Americans, Whites, students age 40-49 and 50+, and disabled students
- 2007-2008: Whites, students age 30-39, 40-49, and 50+, and disabled students
- 2008-2009: Females, African Americans, Native Americans, students age 30-39, 40-49, and 50+, and disabled students
The equity groups that are outlined above consistently claimed significantly lower proportions of the CHEM student population than they did in the credit-student population in the three years examined. The Chemistry program is actively seeking ways to attract a more ethnically diverse student enrollment in its courses. We involve ourselves in student organizations like MESA and the Engineering Club and we have a very popular presence in the twice yearly MESA Science Fair. Other ways of attracting students into our program are being explored which include participation in events at our local high schools.

The following groups consistently claimed lower proportions of the CHEM student population than they did among the credit-student population across the college:

✓ Students age 40-49, and 50+, and disabled students.

The differences in the age distribution in the Chemistry program as compared to the college as a whole might be appropriate for the program, given that students who are enrolling in CHEM courses are usually seeking degrees or intend on transferring to universities and state colleges – both of which are more typical educational goals among younger students.

(3) Retention & Successful Course Completion by Equity Group

The successful course completion rates claimed by CHEM tended to be higher than successful course completion rates among NVC’s instructional programs until 2008-2009. Although there are cases of equity groups claiming lower retention and successful course completion rates within CHEM than they did among the college as a whole, there is not a consistent pattern among these cases. This applies to the performance of equity groups within the program (as no group claims a significantly lower proportion of the retained/successful population than it does of the enrolled population) as well as to the performance of equity groups in Chemistry vs. the college as a whole.

However, in 2008-2009, most equity groups claimed lower successful course completion rates in CHEM than they did across the college. For three equity groups, the differences in rates (program vs. institution) were statistically significant. These differences were not consistent over the three years examined here. Within CHEM, the equity analysis did not yield any significant differences in the successful course completion of different groups of students.

B. Compare student enrollment, retention, and successful course completion rates for online courses to equivalent data for conventional and hybrid courses.

None – does not apply
C. Compare student enrollment, retention, and successful course completion rates for off-campus courses to equivalent data for on-campus offerings.

It has been noted that the overall retention rate and course completion rate of off-campus offerings is lower than those rates of on-campus offerings, but that these differences are not statistically significant. Also, off-campus enrollment is lower than the same classes offered on campus. This is to be expected because of the location, service area, and allowable class size for off-campus offerings. The Up Valley Campus (UVC) does not provide classrooms or lab space sufficient for large sections of Chemistry and neither does the community provide enough students to fill large sections.

With respect to the small disparity in retention and completion rate, this is due, in part, to the differences in the faculty teaching those courses. Traditionally, off-campus courses have been taught by adjunct instructors, but in the past two years these offerings have been taught by our full-time instructors. We anticipate that our retention and completion rates at the UVC to come more in line with the offerings at the main campus.

D. Identify strategies used to identify and assist students at risk. Discuss their effectiveness.

The Chemistry faculty are actively engaged in the MESA program. The MESA Program is an academic program that supports educationally disadvantaged community college students to excel in math, engineering, and science so they can transfer to four-year colleges or universities as majors in these fields. One faculty member is the faculty advisor of Engineering for MESA and another runs Academic Excellence Workshops multiple times per week. Academic Excellence Workshops are scheduled in math and science core classes and teach students how to maintain high academic outcomes through group study. These group studies are student organized but facilitated by instructors who lead the students in the methods needed to succeed in their discipline, in this case, Chemistry.

In addition, we encourage and support the use of Supplemental Instruction (SI) for our classes and actively recruit tutors. In 2007 a study was done at NVC of the students attending the Supplemental Instruction meetings in Organic Chemistry. Those attending the sessions scored 20% higher than those that did not. This translated to an 88.2% completion rate in 2007 as compared to a completion rate of 75% in 2006 and 81.6% in 2005, years when Supplemental Instruction was not offered. Because of the increased success rate these program provide, at risk students are encouraged to attend SI and AEW meetings and/or are told how to seek the help of a tutor and testing services.

E. What has the program done to formalize links with support services for students?

The Chemistry faculty has added student support information in their class syllabi like Disabled Students Programs and Services (DSPS), Counseling Services, Student Services, Financial Aid, and the Testing and Tutoring Center and has provided links to these services on their websites. We also discuss the availability of these resources in our introductions on the first day of class and continue to talk
about them throughout the semester. Many of us hold Academic Excellence Workshops and Club meetings in the MESA common area to enhance visibility of these services. We have also asked representatives of some of these services to make presentations in our classroom.

F. Review the full-time/part-time instructor ratio. Discuss trends and needs.

The Chemistry department’s full time to part time instructor ratio is 3 FT/2 PT. We believe that the current ratio is optimal since it places a full-time instructor in all of our course offerings and adjuncts in extra sections. This allows students the opportunity to choose among the instructors and find a full-time instructor in every class should they desire it.

Three years ago we had as many as five part-time instructors who taught CHEM 110. When class sizes became small, sections were cancelled, and in 2007-2008 we had to release three of our adjunct instructors. We also closed one section of CHEM 240 because of low enrollment. In the past year enrollment in all of our courses has dramatically increased. All of our day classes except those taught Up Valley and at the New Tech High School are filled to capacity and most have waiting lists. It is clear that, with increased enrollment, there is a much greater need for increasing our part-time faculty, but because of the at this time, we are not allowed to add more classes to our schedule.

We anticipate a need to add at least two more part-time instructors to take care of the extra students wanting to take our CHEM 110. We also anticipate the need to add another section of CHEM 120 (General Chemistry) and CHEM 240 (Organic Chemistry) in the Fall semester. These classes are growing rapidly and have recently reached capacity. Many students in the Fall 2009 semester of CHEM 120 were turned away, so more instructors are needed. Since the part-time instructor would be teaching a second section of a class that is already being taught by a full-time instructor, these additional classes could be taught by adjunct instructors.

G. Review the data on degree/certificate completion and any job placement data available. Assess the effectiveness of your program. (vocational programs only)

In the years between 2004 and 2009 Napa Valley College has conferred degrees on 2248 students. Of these, 442 of them received their degree in a Biological or Physical Science. Since all science majors require at least one class in chemistry, the chemistry program has contributed to 19.66% of all the degrees awarded at Napa Valley College. In addition, the Chemistry department was integral in the awarding of AS degrees in Nursing and the awarding of Nursing Certificates.

H. Reflect on your responses in Section 6. Student Success and Equity and write objectives for improvement on Schedule A.

See attached Schedule A.

Approved__________________________________________ Date__________

Director, Institutional Research
7. Planning and Budget Requests

While answering the questions in this section, consider the staffing available, the existing budget, as well as the objectives that you included on Schedule A. Schedule A will be your program plan and will be sent to your division chair to be included as part of the division plan. Complete Schedules B-I, as needed, to justify requests for additional resources.

A. Program Plan. Reflect on your responses to all of the questions above. If changes and/or improvements are needed, write objectives on Schedule A. Add other objectives that will further the mission of your program. The objectives must support the NVC Strategic Plan Goals and Objectives. In the right column of Schedule A, identify all additional resources that are needed to accomplish these objectives.

The Chemistry faculty have heavy teaching loads. Our classes are larger, they generate higher total FTES, and we maintain more student contact hours (WSCH) than the campus norm. Our course offerings are full with waiting lists. We have managed to do this without increasing the number of full time faculty and without an increase in our budget in the past 10 years.

The goal of the Chemistry program is to grow by 1) implementing the Physical Science Refurbishment Project which will add an additional lab and expand our existing labs 2) increase enrollment by offering more courses at more convenient times 3) increase our annual budget to provide the chemicals and equipment required by the increased enrollment 4) increase the number of full time faculty to accommodate the extra sections and increased course offerings.

Schedule A outlines the specific objectives and proposed actions that the department has identified that relate both to the NVC Strategic Plan Goals and the departmental goals described above.

B. Faculty and Staff. Summarize the staffing resource needs identified in Schedule A. Discuss any changes needed. Complete Schedule B. Request for Permanent Faculty and Staff form as needed.

The department is requesting one additional full-time faculty member. The most immediate need is for a full-time instructor in our new course, Chemistry for the Health Sciences. We anticipate a large number of sections of this course and project increases in all of our current course offerings. The same instructor would teach Quantitative Analysis, CHEM 242, a specialized class that has not been taught in several years for lack of teaching personnel (See Schedule B).

In August of 2010 our current instructional assistant (IA) will be leaving to attend Medical School. This position is particularly important to us since it is our IA who prepares the chemicals and equipment of for all of our labs and does the ordering for our department. Our concern is that the current hiring freeze will not allow us to fill this position with new personnel. This would place an unreasonable burden on our full and part time faculty who use the IA’s services on a daily basis (See Schedule B).
C. Operational Budget. Are operational funds appropriate to enhance program success? If not, how would additional operational funds be used to enhance program success? Complete Schedule C Request for Operating Budget Augmentation form as needed.

The operational budget for the Chemistry Department has remained at $5999 for more than 10 years, but the costs associated with running our labs have dramatically increased. As a consequence we are forced to have students work in groups on projects that would be best done alone or wait on equipment and glassware while others use it. Some of our new equipment requires maintenance of consumable chemicals that is costing us $300 or more per year to maintain. We were not able to accept a maintenance contract on existing equipment for lack of funds. We are constantly running out of simple items like hotplates, beakers, flasks, and burets and are forced to have students share them. An increase in our budget from $5999 to $8000 would allow us to fill these needs and more properly support our students in lab. Specifically, these monies would be used to purchase the additional glassware, hotplates, and equipment needed to run our labs effectively (see Schedule C).

D. Program-Specific Equipment. Discuss the strengths and weaknesses of the program-specific equipment available to enhance program success. What needs remain? What strategies are planned to meet those needs? Complete Schedule D Program Specific Equipment Request form as needed.

In 2007 the Chemistry department was given $50,000 to purchase equipment for its chemistry labs. With this money we purchased state-of-the-art equipment, specifically, a new Perkin-Elmer UV-Visible and FT-IR Spectrophotometers. We were also able to purchase additional Vernier Lab Pro computer interfaces, pH meters, glassware and other equipment to enhance our ability to provide experimental equipment in Chemistry. We still lack some major equipment. In particular we need an FT-NMR and GC-Mass Spectrometer for use in organic chemistry. These two machines are considered standard equipment in chemistry. We also need eight new analytical balances. The American Chemical Society makes the following recommendations for two year colleges (taken from ACS Guidelines for Chemistry in Two-Year College Programs, 2009);

* Programs should have a suite of modern chemical instrumentation and specialized laboratory apparatus appropriate for the courses offered, providing hands-on laboratory experiences in synthesis, characterization, and analysis.

* Programs must have certain essential equipment, such as electronic balances, volumetric glassware, pH meters, colorimeters, thermometers or temperature probes, hot plates and/or Bunsen burners, and filtration equipment.

* Standard items, such as automated data-collection devices with associated probes, bench-top centrifuges, melting point apparatus, microscale or full-scale organic kits, gas chromatographs, and UV-Vis spectrometers, are highly recommended for programs serving students pursuing careers in science or health.

* Students pursuing chemistry careers should have access to instrumentation such as FTIR, FT-NMR, and mass spectrometers, if not at the institution, at other locations.
Chemical instrumentation is an evolving area of chemistry. Faculty members should have opportunities to keep abreast of these changes and improve the program’s instrumentation.

The latest equipment purchase in 2007 allowed us to obtain all the items on this list except for the analytical balances, Gas Chromatograph/Mass Spectrophotometer (GCMS) and FT-NMR. These remaining pieces of equipment have been included in the Physical Science Refurbishment Project and we should obtain them by the time this project is completed.

E. Technology. Discuss the strengths and weaknesses of the technology available to enhance program success. What needs remain? What strategies are planned to meet those needs? Complete Schedule E Technology Request form as needed.

The use of computers in the lab is a real strength for our chemistry program. With these computers we are able to acquire data in real time and present graphical outputs that are only a theoretical construct in the classroom. There is, therefore, a real connection made between the theory being taught in the classroom and the reality of these theories as seen in the laboratory.

Unfortunately, the computers to which our Vernier Lab Pro’s attach are beginning to fail and need to be upgraded; we should have 8 networked portable computers on carts to facilitate many of the labs that we do that require the use of computers for data acquisition. Starting with 8 original computers, we now have 5 usable computers left. As more computers are taken out of service, students are required to gather into larger groups or wait until other groups are finished in order to begin their work. Neither experience is satisfactory.

The strategy has been to work on the computers to keep them running until funding can be found to have them replaced. The original computers came to us from Geology, who took them out of service when they were replaced. We do not require state-of-the-art computers to run our labs, but we do need reliability and networking and these current computers can supply neither of these needs. It is anticipated that these computers will be replaced when the Science Building Refurbishment Project is completed (see Schedules E and F).

F. Facilities Improvement/Renovation. Discuss the strengths and weaknesses of the physical resources available to enhance program success. What needs remain? What strategies are planned to meet those needs? Complete Schedule F Facilities Improvement/Renovation Request as needed.

The current lab facility for Chemistry is woefully inadequate to meet our current needs. It no longer meets current safety standards and is not ADA compliant. In 2004 our facility was identified as needing an upgrade and a new facilities plan was drafted. This plan brings our labs into compliance with new fire and safety regulations, the Americans with Disabilities Act, and provides for larger labs, added storage and space for instrumentation. The money earmarked for this project was needed to complete the new Life Science Building (Bldg. 2000) so, by vote of the SME Division; the monies were transferred to that project. We are now awaiting a source of funding to complete the
upgrade to the Chemistry/Physical Science Building (Physical Science Refurbishment Project). See Schedule F.

G. Professional Development. Using the results of the Faculty/Staff Accomplishments survey, summarize the professional development activities undertaken by faculty and staff. Based on the goals that resulted from this program evaluation, complete the Schedule G Professional Development Needs form to indicate what areas of focus have been identified for future faculty/staff development.

- Development of Chemistry for Allied Health Sciences - CHEM 105.
- Updated Chemistry curriculum to comply with the Lower Division Transfer Pattern for CSU’s.
- Upgraded CHEM 110 curriculum to include Math 94 prerequisite
- Updated entire Chemistry curriculum to include SLO’s and current texts.
- Chemistry was a part of the Pilot Assessment Program that did the initial evaluation of SLO’s.
- Hired new full-time instructors to replace two retired instructors.
- Purchased $50K of new equipment to bring Chemistry into American Chemical Society compliance.
- Continued work with Building Committee to upgrade 1800/Science Building.
- Standardization of texts and labs in all its classes.
- Discussions of creating a new Chem Tech program using STEM grant funds in collaboration with the Geology Department.
- Chemistry booth at MESA fairs - very well received.
- Weekly Academic Excellence Workshops in Chemistry held in the MESA labs.
- Supplemental Instruction added to Chemistry program in Organic Chemistry.
- Collaboration with faculty from other schools and universities on research projects.
- Initiated an undergraduate research project in Molecular Phylogenetics (ongoing).
- Member of various hiring committees within the Science, Math, Engineering division.

The Chemistry faculty are committed to maintaining high professional standards and bring a wide variety of teaching techniques into the classroom. Faculty members have attended and will continue to attend a wide array of conferences, seminars and training sessions. They keep current on new discoveries and trends in chemistry by reading periodicals, scientific websites and other current publications and bring this information into the classroom.

It is the goal of the Chemistry Department to improve instruction by improving the quality of the instructor. With this in mind, it is our goal to have all of our instructors attend the Great Teachers Seminar (see Schedule G).
H. Learning Resources/Media Materials. What learning resources (i.e., books, periodicals, videos) are needed to enhance program success? Complete *Schedule H Learning Resources/Media Materials Request* form as needed.

The Chemistry department regularly requires students to use the CRC Handbook of Chemistry and Physics in the classroom and in labs to look up current information about chemistry. The books available in our labs are 30 years out of date and need replacing. In addition, the periodicals available to the college through the library contain a few valuable titles including *Science* but lacks periodicals that cover recent advances in chemistry. We are requesting that the college library subscribe to the *Journal of the American Chemical Society* (JACS) and to *Chemical and Engineering News* (C&EN). These will be valuable to students as well as faculty (see Schedule H).

I. Research. If the program/department needs additional data or research conducted to inform decision making or planning, complete *Schedule I, Research Project Request* form.

None at this time.
## INSTRUCTION PROGRAM/DISCIPLINE PLAN

### PROGRAM NAME: CHEMISTRY

<table>
<thead>
<tr>
<th>NVC Strategic Goal #1 - 5</th>
<th>Program Evaluation Section</th>
<th>Objectives</th>
<th>Priority In Rank Order</th>
<th>Program Activities/Actions</th>
<th>Resources*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1, 2</td>
<td>Implement the Physical Science Refurbishment Project by upgrading and updating the Physical Science building (1800)</td>
<td>1</td>
<td>Campus Planning and Construction already has a plan for refurbishing the 1800 building. This plan is waiting for a funding source.</td>
<td>See Schedule F</td>
</tr>
<tr>
<td></td>
<td>4, 5</td>
<td>Upgrade and streamline the chemistry lab facility</td>
<td>5</td>
<td>Purchase glassware and supplies for Chemistry labs</td>
<td>See Schedule D</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Increase instruction using new/current technologies</td>
<td>6</td>
<td>Purchase equipment to upgrade chemistry lab exercises.</td>
<td>See Schedule D</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Develop methods to improve assessment of student learning outcomes</td>
<td>7</td>
<td>Developing assessment strategy for CHEM 110 &amp; 240</td>
<td>No additional resources needed.</td>
</tr>
<tr>
<td></td>
<td>1, 2</td>
<td>Increase the number of full-time Chemistry faculty</td>
<td>2</td>
<td>Hire another full time chemistry instructor</td>
<td>See Schedule B</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Maintain high standards and consistency between multiple sections.</td>
<td>3</td>
<td>Update all course outlines every five years and coordinate syllabi between instructors.</td>
<td>No additional resources needed.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Evaluate SLO assessment protocols and suggest improvements</td>
<td>8</td>
<td>The chemistry faculty are coordinating the assessment protocols and the data is being collected. Suggestions for improvement will occur once all the data is collected (Spring 2010).</td>
<td>No additional resources needed.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Provide additional sections of impacted courses (CHEM 110, 240).</td>
<td>4</td>
<td>The newly refurbished Science building will provide the lab and classroom space to implement this objective. Additional qualified faculty will be needed to teach these sections.</td>
<td>See Schedule F, See Schedule B</td>
</tr>
<tr>
<td>NVC Strategic Goal #1 - 5</td>
<td>Program Evaluation Section</td>
<td>Objectives</td>
<td>Priority In Rank Order</td>
<td>Program Activities/Actions</td>
<td>Resources*</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------------------</td>
<td>------------</td>
<td>------------------------</td>
<td>----------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>5, 6</td>
<td>6D, 7E</td>
<td>Increase use of computer based data acquisition and education in the lab and classroom</td>
<td>9</td>
<td>This upgrade will take place when the funds are made available for the Science Building Refurbishment.</td>
<td>See Schedule F</td>
</tr>
</tbody>
</table>

* New requests should be defined on resource forms and included in the unit budget.

**Program Evaluation Section**
2. Accreditation & External Reviews
3. Curriculum & Instruction
4. Community Outreach & Articulation
5. Enrollment Trends & Student Satisfaction
6. Student Success & Equity
REQUEST FOR NEW PERMANENT
FACULTY AND STAFF
CHEMISTRY

Accreditation reference: Human resource planning is integrated with institutional planning. The institution systematically assesses the effective use of human resources and uses the results of the evaluation as the basis for improvement.

List in priority order: Project additional needs above and beyond the current status. Please include in your projected needs any known position that will be vacated due to retirement. Replacement positions are not guaranteed. Information will be used in the faculty and staff prioritization processes.

<table>
<thead>
<tr>
<th>Job Title and Justification</th>
<th>N/R*</th>
<th>FTE</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry Instructor</td>
<td>New</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

Justification:
The chemistry department has recently hired two new instructors to replace two instructors that recently retired. We have had three full time instructors in chemistry for the last 25 years but in the past two years we have seen unprecedented growth in the demand for chemistry but lack personnel to teach the extra sections that we need. Currently, we have two courses that cannot be taught because our full time instructors already have full loads and there are no other qualified instructors capable of teaching these specialized classes (CHEM 105, 242). It is important to note that the Biology and Nursing programs are adding more instructors and sections to their programs and all of their students must take chemistry as a prerequisite. To fill those classes we need to offer more sections of Chemistry, particularly CHEM 105 – Chemistry for the Health Sciences. We currently have no instructors available to teach these extra sections and neither do we have anyone qualified to teach CHEM 242 – Quantitative Analysis. In order for the Chemistry Department to grow and provide quality instruction to our prospective Biology and Nursing students, the chemistry department needs to add one more full time faculty position in Chemistry.

Instructional Assistant III

<table>
<thead>
<tr>
<th>Job Title and Justification</th>
<th>N/R*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional Assistant III</td>
<td>Replacement</td>
</tr>
</tbody>
</table>

Justification:
In August of 2010 our current instructional assistant (IA) will be leaving to attend Medical School. This position is particularly important to us since it is our IA who prepares the chemicals and equipment of for all of our labs and does the ordering for our department. Our concern is that the current hiring freeze will not allow us to fill this position with new personnel. Our current IA supports five instructors and more than 600 students. Losing this position would place an unreasonable burden on our full and part time faculty who use the IA’s services on a daily basis. This position is an integral part of the chemistry program and is required for us to function properly. It is our sincere desire that this position will continue to be filled with quality personnel.

*N=New, R=Replacement
# Request for Operating Budget Augmentation

**Program/Unit Name**: Chemistry

**Budget Center**: 6101  
**Activity**: 190500

## Accreditation Reference:

Financial planning is integrated with and supports all institutional planning.

## Operating Budget

This section is used to request and justify non-capital outlay additions to your department’s budget. This form applies only to Account Codes 113XX, 114XX, 523XX, 524XX, 54XXX and 55XXX. **List in priority order.**

<table>
<thead>
<tr>
<th>Account No. &amp; Description</th>
<th>Additional Amt Requested</th>
<th>Justification (Link to Plan)</th>
</tr>
</thead>
</table>

Our budget is currently $6000.00 but our currently budget does adequately supply our current student lab with sufficient chemicals and equipment to provide an adequate chemistry experience. We are upgrading our laboratory exercises and new funding is necessary to procure the equipment and chemicals needed for these new experiments. Most of our budget is used for consumable items like chemicals, glassware and supplies. We need to replace chemicals, burettes, flasks, beakers, dropper bottles, graduated cylinders, tongs, etc. We are requesting an increase of funding from $6,000 to $8,000.

Submitted By:  
Approved By:

________________________  ________________________
Budget Center Manager     President/Vice President

Internet address: [www.napavalley.edu/apps/comm.asp?$1=262](http://www.napavalley.edu/apps/comm.asp?$1=262)
Accreditation rationale: Equipment supports student learning programs and services and improves institutional effectiveness.

Examples of program specific equipment include maps, skeletons, microscopes, artifacts, etc. They may be located in each classroom or centrally located in a workroom. For this request, consider equipment with a value greater than $200. All technology requests should be listed on Schedule E. List in priority order.

<table>
<thead>
<tr>
<th>Description</th>
<th>Estimated Cost</th>
<th>Estimated Annual Maintenance Cost</th>
<th>Justification (Link to Plan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Instructional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Glassware (beakers, flasks test tubes etc.)</td>
<td>$3,000</td>
<td>$300</td>
<td>Replacement of glassware neglected</td>
</tr>
<tr>
<td>● 8 B&amp;L Spec 21 @ 200 each</td>
<td>$16,000</td>
<td>none</td>
<td>nursing chem. lab exercises</td>
</tr>
<tr>
<td>● 9 Mettler Toledo analytical</td>
<td>$27,000</td>
<td>none</td>
<td>nursing chem. lab exercises</td>
</tr>
<tr>
<td>Balances 0.1 mg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Gas Chromatograph/Mass Spec</td>
<td>$65,000</td>
<td>TBD</td>
<td>new lab exercise</td>
</tr>
<tr>
<td>● Anasazi FT-NMR</td>
<td>$61,000</td>
<td>TBD</td>
<td>new lab exercise</td>
</tr>
<tr>
<td>B. Non-instructional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● Explosion proof refrigerator</td>
<td>$1,500-2,000</td>
<td>none</td>
<td>Appropriate storage of flammables</td>
</tr>
<tr>
<td>● Flammable Cabinet</td>
<td>$1,000</td>
<td>none</td>
<td>Appropriate storage of flammables</td>
</tr>
<tr>
<td>● Organics Cabinet</td>
<td>$750</td>
<td>none</td>
<td>Appropriate storage of organics</td>
</tr>
<tr>
<td>● Dishwasher</td>
<td>$500</td>
<td>TBD</td>
<td>Added load of extra chem. lab sections</td>
</tr>
<tr>
<td>● Drying oven</td>
<td>$700</td>
<td>TBD</td>
<td>Added load of extra chem. lab sections</td>
</tr>
</tbody>
</table>

Submitted By:  
Approved By:

Budget Center Manager  
President/Vice President

Internet address: www.napavalley.edu/apps/comm.asp?$1=262

Page 25 of 43
Accreditation reference: Technology planning is integrated with institutional planning. The institution assures that any technology support it provides is designed to meet the needs of learning, teaching, college-wide communications, research, and operational systems.

In order to determine the feasibility of your idea, it is necessary to consult with the Information Technology (IT) Department. It is important that all computer-related technology be centrally coordinated. This will allow the IT Department to know the full picture of the need, to plan for adequate capacity of equipment and infrastructure, and to ensure standardized equipment is purchased, if possible. It is equally important that all technology requests are consistent with the NVC Technology Plan.

List in priority order. Provide a general description of the project that includes:

1. The equipment needed, students and/or staff who will be served, and how often it will be used.
2. Will installation and maintenance support be required?
3. Where will the equipment be located? Will space need to be modified?
4. Describe the infrastructure requirements (i.e. network, power, connectivity, security, etc.)
5. Software support needed (i.e. new licenses, upgrades, system integration, ongoing support)
6. Is additional furniture necessary?
7. Useful life of equipment – when will the equipment need to be replaced?

Eight laptop or portable computers to be placed on carts, a network, and printer.

These portable/laptop computers will be used by approximately 90 students per semester to electronically gather and manipulate data obtained during chemistry lab experiments. We will require a network for printing but do not require an internet connection. These computers will replace existing computers that are beginning to fail. We already have the computer carts and all necessary software and hardware connections required to obtain data. This equipment will be stored in a locked storage room adjacent to our labs. The faculty can maintain these computers and we expect them to be useful for at least 5 years.

Cost estimates will be provided for priority projects only.

Submitted By: __________________________ Approved By: __________________________

Budget Center Manager President/Vice President

Internet address: www.napavalley.edu/apps/comm.asp?$1=262
Accreditation reference: Facilities support student learning programs and services and improve institutional effectiveness. Physical resource planning is integrated with institutional planning.

Small project include remodeling a small area, reconfiguring walls, building shelving, etc. Generally, projects should be under $20,000.

Larger scale projects include construction and renovation projects costing more than $20,000.

In order to make sure that your idea meets legal requirements or is even feasible to do, we ask that you consult with the Director, Facilities Services, and address the following items on the form.

List in priority order.
Provide a description of the project that includes:
- How the project supports the mission and objectives of your program
- Project description
- Location of the proposed project
- Health and safety impacts of the project
- On-going maintenance that will be necessary

No requests at this time. Campus Planning and Construction already has a plan to refurbish the 1800 building that will cost more than the $5000 limit required by this form. This plan is waiting for a funding source.

Cost estimates will be provided for priority projects only.

Submitted By: 

Approved By:

Budget Center Manager

President/Vice President
Accreditation reference: The institution provides all personnel with appropriate opportunities for continued professional development, consistent with the institutional mission and based on identified teaching and learning needs.

Please identify the professional development needs required for faculty and staff to stay current in the discipline, office technology, diversity, safety, instructional methods, and other areas. Specific training and estimated number of attendees are requested.

1. What training needs have been identified from your program review?
   The chemistry faculty want to keep abreast of new and recent technologies and the latest developments in chemistry. We would like to attend the 2010 meeting of the American Chemical Society on March 21-25, 2010 in San Francisco. The program theme is “Chemistry for a Sustainable World.”

2. What pedagogical training needs have been identified in your program review?
   Workshops and seminars with pedagogical issues (e.g., adult learning theories; diversity issues; managing students with test and other learning anxieties; providing favorable learning environments in chemistry with students who have disabilities). Some of these may be met by attending the Great Teachers Seminar in August of 2010.

3. What types of technology does your program use? What technology training needs have you identified?
   The chemistry faculty regularly use computer programs including Word, Excel, and PowerPoint. We also use specialized software like Vernier Lab Pro 3, Graphical Analysis 3, WinLab for the UV-Vis Spectrophotometer and proprietary software used to run the FTIR. In addition, we frequently use WebCMS, WebAdvisor, and update our personal web pages using SharePoint.

   Training in SharePoint would be useful to enhance our faculty web pages.

4. What are the leading publications specific to your discipline and/or program?

   Journal of the American Chemical Society (JACS)
   Journal of Chemical Education (J.Chem.Ed)
   Advances in Physical Chemistry (Adv.Phys.Chem)
   Beilstein Journal of Organic Chemistry (BJOC)
   Inorganic Chemistry (INOCAJ)
   Journal of Chemical Science (JCS)

Submitted By: ___________________________  Approved By: ___________________________

Budget Center Manager  President/Vice President

Internet address: www.napavalley.edu/apps/comm.asp?$1=262
LEARNING RESOURCES/MEDIA MATERIALS REQUEST CHEMISTRY

Books including Reference:
Number of titles to add: 1

Recommendations/comments/Estimated cost for new materials:
1. CRC Handbook of Chemistry and Physics – 5 copies, 1 for the library and 4 for the Chemistry Department. $150 each x 5 = $750

Periodical Titles: (Newspapers, Journals, Magazines)
Number of titles to add: 2

Recommendations/comments/Estimated cost for new materials:
The offering of periodicals in the library is inadequate for students to research current advancements in chemistry. A subscription to the Journal of the American Chemical Society and Journal of Chemical Education will allow students and instructors to research recent findings in chemistry.
Journal of the American Chemical Society = $4,225
Journal of Chemical Education = $1,500

Electronic Databases and Indexes:
Number of databases to add: 0

Recommendations/comments/Estimated cost for new materials:

Media Collection (closed captioned or DVD):
Number of titles to add: 0

Recommendations/comments/Estimated cost for new materials:

Yes  X  No__  Are library/learning resource service hours adequate for this course/program?

Yes  X  No__  Is the quantity of materials sufficient for students within needed time frame?

Yes  X  No__  Will library/learning resources assignments be used in your course?

Yes ___  No X  Will this course/program require the assistance of library faculty for orientations or other information competency instruction?

___  I would like to meet with a Librarian for developing a plan for selecting and adding materials to the Library or Media Center.

 X  To keep the collection reflecting current knowledge, I will alert the librarians of new developments in my field and send suggestions of books and other materials to be ordered.

Internet address: www.napavalley.edu/apps/comm.asp?$1=262
RESEARCH PROJECT REQUEST
PROGRAM/UNIT NAME CHEMISTRY

Accreditation references:

The institution assesses progress toward achieving its stated goals and makes decisions regarding the improvement of institutional effectiveness in an ongoing and systematic cycle of evaluation, integrated planning, resource allocation, implementation, and re-evaluation. Evaluation is based on analyses of both quantitative and qualitative data. (Standard I.B.3)

The president guides institutional improvement of the teaching and learning environment by ensuring that evaluation and planning rely on high quality research and analysis on external and internal conditions. (Standard IV.B.2.b)

If a need for research or interest in a research project is identified through the Program Evaluation & Planning (PEP) process, please complete this form. If you have any questions, contact the Office of Institutional Research for assistance.

List research projects/requests in priority order.
Provide the following information about each project/request:
- Project description
- Purpose of project
- Link between project and NVC’s strategic goals
- Question(s) project is intended to answer
- Potential changes to current practice that will result from research findings
- Relevant page(s)/section(s) of PEP report identifying need for research

None at this time.

Submitted By: _____________________________
Approved By: _____________________________

___________________________
Budget Center Manager

___________________________
President/Vice President
Program Evaluation Summary

Program: Chemistry

Complete the following sections based on the program evaluation completed. This summary will be forwarded to the Planning Committee after the verification phase is complete.

Program Achievements (major achievements, changes, implementations, progress since last program review)

In the past two years the Chemistry program has gone through some major changes. After the retirement of two long-time faculty members, the hiring of two new replacement faculty members has taken our department in new directions. The following is a summary of the accomplishments and changes that have occurred in our department since the last program review:

- Developed a new course - Chemistry for Allied Health Sciences - CHEM 105.
- Updated Chemistry curriculum to comply with the Lower Division Transfer Pattern for CSU's.
- Upgraded CHEM 110 curriculum to include Math 94 prerequisite
- Updated entire Chemistry curriculum to include SLO's and current texts.
- Hired two new full-time instructors to replace retired instructors.
- Purchased $50,000 of new equipment to help bring Chemistry into compliance with the requirements of the American Chemical Society.
- Continued work with Building Committee to upgrade 1800/Science Building.
- Standardization of texts and labs in all its classes.
- Weekly Academic Excellence Workshops in Chemistry held in the MESA labs.
- Supplemental Instruction added to Chemistry program in Organic Chemistry.
- Collaboration with faculty from other schools and universities on research projects.
- Initiated an undergraduate research project in Molecular Phylogenetics (ongoing).

Strengths (unique characteristics, special capacities)

The greatest strength of the Chemistry department is the dedication to quality education and high standards. The department acts as a cohesive unit which assures a consistency between sections, and we stay current with other disciplines to make sure our students are prepared for more advanced courses within Chemistry and other science-related courses. In the past two years we have replaced equipment to bring our labs in partial compliance with the standards set by the American Chemical Society. As a consequence, our program attracts and retains highly motivated, goal-oriented students, and plays an important role in advancing their academic and professional goals.
Challenges (concerns, difficulties, areas for improvement)

- Lack of required equipment.
The standard set by the American Chemical Society for Chemistry programs at community colleges includes access to an FT-NMR (Fourier Transform Nuclear Magnetic Resonance machine) and a GC-MS (gas chromatography mass spectrophotometer) neither of which are available at our college.

- Facility Refurbishment
The Chemistry facility is not in compliance with current safety and ADA standards. The labs are too small and the space is no longer adequate for teaching chemistry. If the program is to grow, we will need additional lab space.

- Replacing the anticipated loss of our Instructional Assistant.
Our IA will be leaving in August of 2010. The hiring freeze may not allow us to replace this vital position in our department. This position supports three full-time faculty, two adjunct instructors and more than 600 students per year. Without this position filled the full-time faculty will have to assume those duties, not only for their own labs, but also for our adjunct instructors who are not expected to prepare the labs themselves. These added responsibilities will stretch the capacity of our full-time faculty and will undermine the quality of our instruction.

- Funding for equipment and maintenance.
The Chemistry budget has not increased in more than 10 years but the price of chemicals and the shipment of those chemicals have increased dramatically. The new FT-IR we received last year requires maintenance that is costing us more than $300 per year. In order to resupply our chemicals and maintain our equipment the Chemistry department needs an increase in our budget from $6000 to $8000.

- Loss of tutors and supplemental instruction (SI).
In the past year budgetary realities have caused the loss of paid tutors and Supplemental Instruction in Chemistry. These two programs have had a profound effect on our ability to provide a quality education to our students. The SI program has a proven track record of improving the grades in Organic Chemistry. Without it, it is anticipated that the successful completion rate in Organic Chemistry will drop. Budgetary monies must be found that will allow this vital program to resume.

Briefly describe the process used to complete the PEP.

The full-time Chemistry faculty collaborated by email and departmental meetings on the PEP Report. All members contributed to the final report. Dr. Steven Fawl was the lead author and contact person. The information provided by Napa Valley College’s Director of Institutional Research, Robyn Wornall was an invaluable resource for the writing of this report as was the data provided by our SME division chairperson, Dr. Bonnie Moore. Robyn Wornall and Debra Saunders reviewed and suggested edits that greatly improved the final version.
The program evaluation report is reviewed by the program faculty or staff, signed by the program evaluation chair and division chair or supervisor, and forwarded to the V.P. (Instruction or Student Services) or President with a copy to the Office of Research, Planning and Development for the verification phase.

Program Evaluation Chair Signature: ______________________________
Division Chair/Supervisor Signature: ______________________________
Date: ______________________________

Verification Phase

The verification team will review the Program Evaluation Report for accuracy and completeness, and the process used to develop the report (see verification team duties). Once the report is verified, it is forwarded to the appropriate Vice President or President (for administrative services).

Verified on: ______________________________
Verification Committee Signatures: ______________________________

Acknowledgement Phase

The Vice President/President reads and acknowledges the program and planning document and sends a letter to the program team and discipline/program faculty or staff, with copies to the Academic Senate President, the Planning Committee, and the President of the college (who will forward them to the Board of Trustees). The vice presidents and/or President will use program review results to (1) base discussions and decision making on data and evaluation provided by program evaluation; (2) inform program planning; and (3) advocate for program needs.

Vice President/President: ______________________________
Date Letter Sent: ______________________________
Recommend review in 2 years: Yes No
# PROGRAM EVALUATION AND PLANNING

## STUDENT LEARNING OUTCOME (SLO) MATRIX

### CHEMISTRY

<table>
<thead>
<tr>
<th>COURSE</th>
<th>#1 Describe chemical and physical processes at the molecular level and how they relate to biological and regulatory systems.</th>
<th>#2 Solve both qualitative and quantitative chemistry problems while demonstrating the reasoning clearly and completely.</th>
<th>#3 Implement laboratory techniques correctly using appropriate safety procedures and express them clearly in written laboratory reports.</th>
<th>#4 Describe chemical and physical processes at the molecular level and how they relate to organic and biological systems.</th>
<th>#5 Solve synthetic reaction pathways and mechanisms while demonstrating the reasoning clearly and completely.</th>
<th>#6 Solve quantitative chemistry problems while demonstrating the reasoning clearly and completely.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 105</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 110</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 111</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 120</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 121</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 240</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 241</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 242</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
INSTRUCTIONAL PROGRAM EVALUATION SELF-STUDY

CURRICULUM ACTION PLAN

PROGRAM: Chemistry

PROGRAM FACULTY: Fawl, Quinlan, Murphy

DATE: March 18, 2009

1. COURSE REVIEW LIST AND TIMELINE
   A. COURSES REVIEWED WITHOUT SUBSTANTIVE REVISIONS
      The following courses have been revised within the last five (5) years and/or do NOT require substantive changes to remain current.

<table>
<thead>
<tr>
<th>COURSE NUMBER</th>
<th>COURSE NUMBER</th>
<th>COURSE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 111</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 121</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 240</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 241</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 242</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMMENTS

The process of updating these courses was begun in the Fall 2008. All but one of them (CHEM 242) have been or soon will be on the Curriculum Committee consent calendar. Only CHEM 242 has not been revised or submitted. This class is only rarely taught so the focus was placed elsewhere. CHEM 242 will be revised before the end of the Spring 2009 semester.
B. **COURSES THAT REQUIRE SUBSTANTIVE REVISIONS: DUE BY FALL 2008**

The following courses need substantive revisions to course description, content, objectives, assessment methods, assignments, or conditions on enrollment.

<table>
<thead>
<tr>
<th>COURSE NUMBER</th>
<th>COURSE NUMBER</th>
<th>COURSE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**
No courses require substantive change.

C. **COURSES TO BE MOVED TO OBSOLETE OR ARCHIVED STATUS**

The following courses or course numbers are no longer relevant to our program. Those listed as Obsolete are outdated course numbers that correspond to currently offered courses. Those listed as Archive are courses that are no longer offered and which will be moved to Archived status.

<table>
<thead>
<tr>
<th>COURSE NUMBER: OBSOLETE</th>
<th>COURSE NUMBER: OBSOLETE</th>
<th>COURSE NUMBER: ARCHIVE</th>
<th>COURSE NUMBER: ARCHIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>See below</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**
All obsolete courses were submitted to the Curriculum Committee in the Fall 2008. They have been removed and are no longer available to fill out this list.
2. **NEW COURSES**

<table>
<thead>
<tr>
<th>COURSE NUMBER</th>
<th>COURSE TITLE</th>
<th>PROPOSED UNITS/HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 105</td>
<td>Chemistry for the Health Sciences</td>
<td>4 units – 108 hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 hrs lecture = 54 hrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 hrs lab = 54 hrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total = 108 hrs</td>
</tr>
</tbody>
</table>

**COMMENTS**
Chemistry 105 was submitted to the Curriculum Committee in the Fall 2008. It is awaiting final approval. It is to be offered in the Fall of 2009.

3. **COURSE-LEVEL STUDENT LEARNING OUTCOMES**

All course level SLO’s have been completed.

4. **DEGREE OR CERTIFICATE REVISION TIMELINE**

No changes are proposed to the current Chemistry course requirements for the Associates Degree (AA) in Physical Sciences. We do not currently offer any Certificate programs in Chemistry.
## Chemistry 110 Assessment & Rubrics

**SLO 1:** Describe chemical and physical processes at the molecular level and how they relate to the macroscopic environment.

<table>
<thead>
<tr>
<th>Failure 0</th>
<th>Poor 1</th>
<th>Average 2</th>
<th>Above Average 3</th>
<th>Excellent 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student is unable to:</td>
<td>Student is inconsistent:</td>
<td>Student is able to:</td>
<td>Student is able to:</td>
<td>Student is able to:</td>
</tr>
<tr>
<td>Relate atomic theory explaining the relationship between light emission and electron level.</td>
<td>Relate atomic theory explaining the relationship between light emission and electron level.</td>
<td>Relate atomic theory explaining the relationship between light emission and electron level.</td>
<td>Relate atomic theory explaining the relationship between light emission and electron level; predict the color for a given emission, and predict forbidden transitions.</td>
<td></td>
</tr>
<tr>
<td>Balance a reaction equation and partially complete a basic stoichiometry.</td>
<td>Balance a reaction equation and partially complete a basic stoichiometry.</td>
<td>Balance a reaction equation; partially complete a basic stoichiometry mass-mass problem.</td>
<td>Balance a reaction equation, successfully complete a basic stoichiometry mass-mass problem, determine a limiting reagent.</td>
<td></td>
</tr>
<tr>
<td>Use intermolecular forces to explain polar vs. nonpolar concepts, partially predict and rank order mp &amp; bp of substances.</td>
<td>Use intermolecular forces to explain polar vs. nonpolar concepts, partially predict and rank order mp &amp; bp of substances.</td>
<td>Use intermolecular forces to explain polar vs. nonpolar concepts, predict and rank order mp &amp; bp of substances.</td>
<td>Use intermolecular forces to explain polar vs. nonpolar concepts, predict and rank order mp &amp; bp of substances.</td>
<td></td>
</tr>
<tr>
<td>Predict ionic charge for elements and polyanions, partially use electronegativity concept to predict degree of polarization.</td>
<td>Predict ionic charge for elements and polyanions, partially use electronegativity concept to predict degree of polarization.</td>
<td>Predict ionic charge for elements and polyanions, use electronegativity concept to predict degree of polarization.</td>
<td>Predict ionic charge for elements and polyanions, use electronegativity concept to predict degree of polarization, implement mole ratios with charges.</td>
<td></td>
</tr>
</tbody>
</table>

**SLO 2:** Solve both qualitative and quantitative chemistry problems while demonstrating the reasoning clearly and completely.

<table>
<thead>
<tr>
<th>Failure 0</th>
<th>Poor 1</th>
<th>Average 2</th>
<th>Above Average 3</th>
<th>Excellent 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student is unable to:</td>
<td>Student is inconsistent:</td>
<td>Student is able to:</td>
<td>Student is able to:</td>
<td>Student is able to:</td>
</tr>
<tr>
<td>Calculate amounts of substances necessary to create specific solution, determine any solution concentration.</td>
<td>Calculate amounts of substances necessary to create specific solution, determine any solution concentration.</td>
<td>Calculate amounts of substances necessary to create specific solution, sometimes determine any solution concentration.</td>
<td>Correctly calculate amounts of substances necessary to create specific solution, determine any solution concentration, perform dilutions.</td>
<td></td>
</tr>
<tr>
<td>Interpret data involving gas phase, calculate volume, pressure, temperature problems, and implement the ideal gas law.</td>
<td>Interpret data involving gas phase, calculate volume, pressure, temperature problems, and implement the ideal gas law.</td>
<td>Interpret data involving gas phase, calculate volume, pressure, temperature problems, and implement the ideal gas law.</td>
<td>Interpret data involving gas phase, calculate volume, pressure, temperature problems, implement the ideal gas law, and solve partial pressure problems.</td>
<td></td>
</tr>
<tr>
<td>Determine the pH of solutions, predict if solutions acids or bases.</td>
<td>Determine the pH of solutions, predict if solutions acids or bases.</td>
<td>Determine the pH of solutions, predict if solutions acids or bases.</td>
<td>Determine the pH of solutions, predict if solutions acids or bases, perform titration.</td>
<td></td>
</tr>
<tr>
<td>bases, perform any titration calculations.</td>
<td>perform any titration calculations.</td>
<td>bases, sometimes perform titration calculations.</td>
<td>bases, perform titration calculations, and calculate pH problems involving buffers.</td>
<td>calculations, calculate pH problems involving buffers, and generate acids &amp;/or base solns.</td>
</tr>
</tbody>
</table>
SLO 3: Implement laboratory techniques correctly using appropriate safety procedures and express them clearly in written laboratory reports.

<table>
<thead>
<tr>
<th>Failure 0</th>
<th>Poor 1</th>
<th>Average 2</th>
<th>Above Average 3</th>
<th>Excellent 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student is unable to:</td>
<td>Student is inconsistent:</td>
<td>Student is able to:</td>
<td>Student is able to:</td>
<td>Student is able to:</td>
</tr>
<tr>
<td>Answer any post lab questions correctly, report data clearly with units, and properly perform any lab calculations.</td>
<td>Answer some post lab questions correctly, report data clearly with units, and sometimes properly perform lab calculations.</td>
<td>Answer some post lab questions correctly, report data clearly with units, and properly perform lab calculations.</td>
<td>Answer some post lab questions correctly, report data clearly with units, and properly perform lab calculations.</td>
<td>Answer post lab questions correctly, report data clearly with units, properly perform lab calculations.</td>
</tr>
<tr>
<td>Understanding most safety procedures, generally perform safe lab practices, handle reagents properly, and pass a safety quiz at 60%.</td>
<td>Understanding most safety procedures, perform safe lab practices, handle reagents properly, and pass a safety quiz at 70%.</td>
<td>Understanding safety procedures, perform safe lab practices, handle reagents properly, and pass a safety quiz at 80%.</td>
<td>Understand safety procedures, perform safe lab practices, properly dressed for laboratory, handle reagents properly pass a safety quiz with 90%.</td>
<td></td>
</tr>
<tr>
<td>Dispense solids and record masses, dispense measured solutions somewhat accurately, read volumetric measurements somewhat accurately.</td>
<td>Dispense solids and record masses, dispense measured solutions somewhat accurately, read volumetric measurements somewhat accurately.</td>
<td>Dispense solids and properly record masses, dispense measured solutions accurately, read volumetric measurements accurately.</td>
<td>Dispense solids properly and accurately record masses, dispense measured solutions correctly, use correct volumetric devices, read volumetric measurements accurately.</td>
<td></td>
</tr>
<tr>
<td>Determine by titration the pH of an unknown vinegar solution, calculate and accurately report % of vinegar within 2.5%.</td>
<td>Determine by titration the pH of an unknown vinegar solution, calculate and accurately report % of vinegar within 2.5%.</td>
<td>Determine by titration the pH of an unknown vinegar solution, calculate and accurately report % of vinegar within 1.5%.</td>
<td>Determine by titration the pH of an unknown vinegar solution, calculate and accurately report % of vinegar within 0.5%.</td>
<td></td>
</tr>
</tbody>
</table>

Sample Questions:

**SLO 1**

A1. Which of the following energy-level changes for an electron is least energetic?

A) $3 \rightarrow 2$  
B) $4 \rightarrow 3$  
C) $5 \rightarrow 4$  
D) $2 \rightarrow 1$  
E) All changes have the same energy

A2.

B1. Balance this reaction.

$$\underline{\text{H}_2\text{O}_2(l)} \quad \rightarrow \quad \underline{\text{H}_2\text{O}(l)} + \underline{\text{O}_2(g)}$$

B2. If 5.58 g of powdered iron reacts with powdered sulfur to produce 8.79 g of iron(II) sulfide, what is the mass of reacting sulfur? (4 pt)

A) 5.58 g  
B) 8.79 g
B3. Considering the limiting reactant concept, how many moles of C are produced from the reaction of 1.50 mol A and 3.50 mol B?

A(g) + 2B(g) → 3C(g)

A) 1.00 mol  
B) 4.50 mol  
C) 2.00 mol  
D) 5.25 mol  
E) impossible to predict from the given information

C1. Consider the following liquids with similar molar masses. Predict which has the strongest intermolecular attraction based only on vapor pressure data.

A) butane (vapor pressure @ 20°C = 1550 mmHg)
B) isopropyl alcohol (vapor pressure @ 20°C = 35 mm Hg)
C) ethyl methyl ether (vapor pressure @ 20°C = 1260 mm Hg)
D) acetic acid (vapor pressure @ 20°C = 14 mm Hg)
E) ethyl chloride (vapor pressure @ 20°C = 1050 mm Hg)

C2.

C3. Based only on intermolecular attraction, predict which of the following liquids has the highest boiling point.

A) CH₃-CH₂-O-CH₃  
B) CH₃-CH₂-S-CH₃  
C) CH₃-CO-OH  
D) CH₃-CH₂-CH₂-CH₂-CH₃  
E) CH₃-CH₂-CH₂-Cl

C4. What is the molecular shape of a methane molecule, CH₄?

A) tetrahedral  
B) bent  
C) trigonal pyramidal  
D) linear

D1. Given the electronegativity values of N (3.0) and O (3.5), illustrate the bond polarity in a nitrogen monoxide molecule, NO, using delta notation.

A) (δ-) N-O (δ-)  
B) (δ+) N-O (δ+)  
C) (δ-) N-O (δ+)  
D) (δ+) N-O (δ-)

D2. Draw the molecular formula for the phosphate ion, include the charge on this polyanion.

D3. What is the predicted ionic charge for a lead ion?

A) 1+  
B) 3+  
C) 4+  
D) 1-  
E) 4-
D4. What is the ionic charge for the nickel ion in Ni(NO\textsubscript{3})\textsubscript{2}?

A) zero  
B) 1+  
C) 2+  
D) 3+  
E) 2-  

SLO 2

A1. What is the mass of barium hydroxide (FW=171.4 g/mol) dissolved in 0.500L of 0.100M of Ba(OH)\textsubscript{2} solution?

A2. What is the volume of 3.00 M sulfuric acid that contains 9.809g of H\textsubscript{2}SO\textsubscript{4} solute?

A3. How would one prepare 100 mL of 0.250 M solution of HBr from 3.00 M stock solution?

B1. If 1,000 g of tin metal reacts with 0.640g of fluorine gas, what is the empirical formula of the product? (Hint Sn\textsubscript{x}F\textsubscript{y})

B2. If 37.5 mL of 0.100 M calcium chloride reacts completely with aqueous silver nitrate, what is the mass of AgCl precipitate? Balance first.


C1. If the density of an unknown gas is 1.95 g/L at STP, what is its molar mass?

C2. What is the volume occupied by 10.0g of nitric oxide gas, NO, at STP?

C3. At the same temperature, which of the following noble gases contains atoms with the slowest average velocity?

A) neon  
B) helium  
C) argon  
D) krypton  
E) The average velocity is the same.

D1. What is the pH of an aqueous solution if the [H+] = 0.000001 M?

A) 4.2  
B) 6.0  
C) 5.0  
D) 7.2  
E) None of these.
D2. What is the molarity of a nitric acid solution if 25.00 mL of HNO₃ is required to neutralize 0.424 g of sodium carbonate?  Balance first.  6 pt

\[ ___\text{HNO}_3(\text{aq}) + ___\text{Na}_2\text{CO}_3(\text{aq}) \rightarrow ___\text{NaNO}_3(\text{aq}) + ___\text{H}_2\text{O}(\text{l}) + ___\text{CO}_2(\text{g}) \]

D3. If 25.0 mL of 0.100 \( M \) HCl is titrated with 0.150 \( M \) Ba(OH)₂, how many milliliters of barium hydroxide are required to neutralize the acid?

\[
2 \text{HCl(aq)} + \text{Ba(OH)}_2(\text{aq}) \rightarrow \text{BaCl}_2(\text{aq}) + 2 \text{H}_2\text{O(l)}
\]

a. 8.33 mL  
b. 16.7 mL  
c. 18.8 mL  
d. 33.3 mL  
e. 37.5 mL

SLO 3

A1. Select questions post lab from make 3 gases, did a reaction occur, chemical reactivity series, determine a mol of gas.

A2. Grade data & calculations from determine a mol of gas & titration of Vinegar

B1. Safety Quiz

B2. Observe and grade for proper lab attire, lab safety, MSDS chemical lookup

B3. Reagent use and cleanup grade

C1. pH of vinegar lab calculation

C2. % acid in vinegar lab