

# Santa Rosa Junior College

## Program Resource Planning Process

### Chemistry and Physics 2015

#### 1.1a Mission

The mission of the Chemistry program (now part of the Department of Chemistry and Physics) at Santa Rosa Junior College is to provide a comprehensive program for general education, transfer, and career and technical education students, and to engage in community outreach. The program emphasizes the teaching and practice of chemistry in a manner that fosters student success, is safe and environmentally responsible, and prudently manages available resources.

#### PHYSICS:

The Physics Program's primary mission is to provide the physics course work and the related academic training required for transfer students in science, Engineering and pre-professional majors. The department's secondary mission is to foster the scientific and technological literacy of the total student population through general education and enrichment classes and activities.

#### 1.1b Mission Alignment

The Chemistry program's mission is in keeping with the College's mission. Specifically, we focus on preparing students for STEM transfer and CTE disciplines that require Chemistry.

In terms of Strategic Planning Goals, the Chemistry program is directly involved in the following:

- A. We foster learning and academic excellence by hiring and mentoring outstanding faculty, and offering rigorous, relevant, and up-to-date curriculum.
- B. We strive to serve our diverse community through our program.
- C. We contribute toward a culture of sustainability by having an awareness of the impact of running our program on the environment and choosing responsible and sustainable practices and experiments.

#### PHYSICS:

The Physics program goals aligns directly with the district's central mission of education to increase the knowledge, improve the skills, and enhance the lives of our students. The program's lower division academic coursework builds the knowledge and skills of our transfer and general education students. The Physics Program offers support services targeted to STEM students to improve student success and professional development. Although not a vocational program, the program also has an important role to play in our community's economic development and global competitiveness because of the pivotal role engineers and scientists play in those arenas. SRJC is the only academic institution in Sonoma County delivering the

complete spectrum of lower division engineering coursework and thus has a crucial role to play in meeting the needs of our community.

The Physics Program strives to participate in the district's college initiatives. Regarding Initiative I, the faculty of the Program represents the college in many community and professional organizations and work to improve K-16 articulation. Regarding Initiative V, the Physics faculty has developed SLO's for both our department's majors and almost all of our department's classes.

## 1.1c Description

The Chemistry program is housed within the Department of Chemistry and Physics and provides rigorous preparation for STEM transfer and CTE students.

The program is staffed by six full-time and several adjunct (part-time) instructors who have great enthusiasm for teaching. The program offers day, evening, and weekend classes at the Santa Rosa and Petaluma campuses. The program maintains high educational standards and places primary emphasis on quality undergraduate instruction.

The Chemistry program takes pride in well-maintained and equipped laboratories that include a network of over 40 computerized data acquisition stations in addition to the typical laboratory equipment. Modern instruments regularly used by students include a GC/MS, NMR, FTIR, Fast Sequential AA, and several UV-VIS spectrometers.

The program is staffed by two full-time laboratory technicians who ensure that reagents, supplies and equipment are available and in good working order for all experiments. High standards for environmental health and safety are diligently maintained.

### PHYSICS:

The Physics program provides a standard core of lower division physics courses to prepare students to transfer to a four-year university to complete a science or Engineering bachelor's degree. In addition, we also offer AS degree in Physics. We also offer courses to fulfill general education requirements and self-enrichment goals, although recent schedule reductions have all but eliminated those offerings. In addition to developing an understanding of basic concepts in physics and their applications in the world in which we live, our courses develop analytical thinking, problem solving, visualization, design, and laboratory skills.

The Physics program is very proud to host a wide range of excellent auxiliary services to enrich our students' academic and professional development. The Physics program coordinates student participation in the Physics Club, the Women in Science and Engineering (WISE) Club, and with cooperation of the Engineering program, the Engineering Club (TEC). Our program combined with Engineering boasts one of largest scholarship programs at SRJC with over 30 student scholarships awarded each year.

For many years, the combined Engineering/Physics department has been working very closely with MESA, (Math Engineering Science Achievement) to develop programs to attract and retain students with economic challenges or backgrounds that place them at a disadvantage. The partnership has been very successful in maintaining and growing a host of support activities in the face of eroding department resources. In the past, MESA and the Engineering & Physics Department have co-sponsored the annual Engineering Job Shadow program that matches more than 30 students each year with industry engineers. MESA and the department also run a Robotics competition with Agilent/Keysight each Spring as well as a graduation ceremony/awards banquet. The department also supports MESA's research projects related to the engineering and physics disciplines.

Our Program also actively serves our community by delivering planetarium shows, providing A&L presentations, staff development activities, community events, community education courses, conference presentations, and participation in professional organizations. For example, Lynda organized a very successful talk with world renowned physicist Leonard Mlodinow this year to sold out crowds. Last year Lynda produced four planetarium shows, donating all of her time to raise money for the Planetarium program, raising over \$2000. Physics also participated in the Bay Area Science Festival.

The biggest change to the Physics program was the elimination of our 80 years old Engineering/Physics department, making each discipline a program and placing both in the Applied Technology department back in Fall 2011. All the faculty members of Engineering and Physics programs strongly believed that the re-organization was done without any analysis of long term effect on the students and classes in particular and the programs in general. As far as we know, Physics program is the only discipline classified as a program that caters to transferring students.

With the recent merging and formation of the department of Chemistry and Physics in July of this year, the Physics faculty members are feeling very optimistic about the future of the Physics program and are looking forward to setting goals for future growth.

## 1.1d Hours of Office Operation and Service by Location

At the Santa Rosa campus, the chemistry program offers classes from 7:30 am until 6:00 pm Monday, Tuesday, Wednesday and Friday, and 7:30 am until 10:00 pm Thursday, and on Saturdays from 9:00 am until 3:00 pm. At the Petaluma campus, the program offers two courses (5 sections total) of Chemistry for the Allied Health Sciences and Basic Chemistry Skills, Monday through Thursday. During all hours of operation on both campuses, a Coordinator of Science Labs, a Science Lab Instructional Assistant or a Science Lab Technician is on duty. An AAI staffs the Santa Rosa campus 28 hours per week.

### PHYSICS:

The Physics classes/labs are offered Mondays through Fridays during the Spring and Fall semesters, from

9:00 am and well into the evening. For the first time, we also offered a section of PHYS1 class on Saturdays during the Spring 2014 semester. In addition to the introductory/problem solving Physics class, PHYS 1, we have also been offering PHYS41 (a calculus based Physics lecture and lab) and PHYS21/21L (Lecture/Lab) for the past two summers

#### **Petaluma :**

As more science and Math classes are being offered in Petaluma, the Physics program recognizes the future need to offer more Physics classes at Petaluma campus. Lack of sufficient FT instructors has been a major factor in limiting class offering at the Petaluma campus.

## 1.2 Program/Unit Context and Environmental Scan

The chemistry department is staffed by energetic and dynamic individuals, dedicated to fulfilling our mission by providing a comprehensive program for transfer and CTE students. Although a relatively small percentage of our students go on to a bachelor's program in Chemistry, our program serves those pursuing degrees in the Life Sciences, Physical Sciences, Engineering, and pre-professional programs such as the medical, dental, and veterinary fields. Our Chemistry 60 course serves as an entry point for students who wish to enroll in the nursing and dental hygiene programs. We also have a basic skills course offering, Chem 100, which helps to prepare students for a transfer or CTE path that requires more advanced chemistry courses.

There is currently no TMC (Transfer Model Curriculum) for Chemistry, but when that is developed and approved, it is possible that the department will need to modify curriculum, scheduling and/or the A.S. Chemistry major itself. Otherwise, there are no trends evident in any social, industrial, technological or educational context that would impact the department's program.

#### **PHYSICS:**

The Physics program had a long history of partnership with both local industry and professional groups. Local companies host field trips, supply guest speakers, donate funds for student programs, provide internships and scholarships, and supply adjunct faculty. This points to the strength of our program, its tight linkage to local industry, and the essential role it plays in supplying our local needs. The newly formed Physics program is committed to take advantage of the surge in the area of nanotechnology to offer one or more new courses and has already implemented nanotechnology in some of the courses being taught.

## 2.1a Budget Needs

#### **CHEMISTRY**

In the following discussions we do not include our 4391 budget since it is a student fee based account used to purchase aprons and goggles that are provided to the students. We purchase these items and provide them to students at our cost in return for their student fee. We really have no control over how this account functions. We also don't consider one-time augmentations since they are not on-going funding.

At this writing we have not had any reductions to our 4000 or 5000 accounts and we are projecting that we will use all the funds.

We are normally quite frugal with our funds, and try to bid every item we purchase, rather than only when it is required by purchasing regulations.

Our supplies and services allotment will need to be examined on a year-to-year basis. It is very likely that our budget will need to increase periodically in order to keep pace with the constantly-rising costs of chemicals and glassware. We will continue to rely on instructional equipment funds to replace aging equipment.

The Chemistry supplies and services allotment will need to be examined on a year-to-year basis. It is very likely that our budget will need to increase periodically in order to keep pace with the constantly-rising costs of chemicals and glassware. Additional funds for our requested staffing increases will also be required.

## PHYSICS

The transfer of the Physics program to Chemistry should arrest the decline of the resources needed to maintain the quality of our programs.

Since the 1990's, the Physics labs have been trying to build to 13 complete sets of all physics lab equipment using our modest supplies budget. Most of the physics lab equipment was purchased at a time when 8 lab stations would meet the needs of our enrollments. The supplies budget is also needed to repair and replace broken physics equipment, much of which is over 30 years old. The district should augment the Physics supplies budget and award more than one equipment request per year to the program.

The Chemistry and Physics programs have a need to see restoration of district funding for graders and faculty travel. The intensive laboratory assignments required to ensure quality education for our students necessitate reader support for faculty. Lack of local industry employing chemistry and physics professionals requires us to travel to conferences for professional development and networking.

### 2.1b Budget Requests

| Rank | Location | SP | M  | Amount     | Brief Rationale                                                                                                                                                                                                         |
|------|----------|----|----|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0001 | ALL      | 00 | 00 | \$5,000.00 | Increase due to rising costs of chemicals and supplies.                                                                                                                                                                 |
| 0001 | ALL      | 00 | 00 | \$6,000.00 | Replacement of essential demonstration and laboratory equipment. Specifically, \$3,000 of the total is required for 39 Thermocouple Vernier TCA-BTAs.                                                                   |
| 0002 | ALL      | 00 | 00 | \$1,700.00 | New annual site license required for ChemDraw Pro. The Chemistry Program has absorbed the cost this fiscal year but it will be an ongoing fee.                                                                          |
| 0002 | ALL      | 00 | 00 | \$5,000.00 | New annual site license required for Multisim. The Physics program requires this for use in labs. It is a circuit simulator software and would be shared with Engineering and Applied Tech. This will be an annual fee. |
| 0003 | ALL      | 00 | 00 | \$1,000.00 | Restore staff travel budget for professional development activities.                                                                                                                                                    |
| 0003 | ALL      | 00 | 00 | \$2,000.00 | Increase staff travel budget for professional development activities.                                                                                                                                                   |
| 0004 | ALL      | 00 | 00 | \$1,200.00 | Restore grader budget.                                                                                                                                                                                                  |
| 0004 | ALL      | 00 | 00 | \$1,200.00 | Restore grader budget.                                                                                                                                                                                                  |

## 2.2a Current Classified Positions

| Position                                            | Hr/Wk | Mo/Yr | Job Duties                                                                                                                                                         |
|-----------------------------------------------------|-------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Coordinator Science Labs (Chemistry)                | 40.00 | 12.00 | Coordinate the Chemistry laboratory operations of the department at Santa Rosa and Petaluma.                                                                       |
| Science Lab Instructional Assistant (Chemistry)     | 40.00 | 12.00 | Performs technical duties in support of the department at Santa Rosa and Petaluma.                                                                                 |
| Administrative Assistant II (Chemistry and Physics) | 28.00 | 12.00 | This position provides administrative support for the department.                                                                                                  |
| Science Lab Technican (Physics)                     | 20.00 | 11.00 | Manage day to day operational activities needed to conduct physics laboratories, replenish, repair, order parts and full experiment apparatus on an ongoing basis. |

## 2.2b Current Management/Confidential Positions

| Position         | Hr/Wk | Mo/Yr | Job Duties                    |
|------------------|-------|-------|-------------------------------|
| Department Chair | 15.60 | 10.00 | Supervision of the department |

## 2.2c Current STNC/Student Worker Positions

| Position                                   | Hr/Wk | Mo/Yr | Job Duties                                                                                                                     |
|--------------------------------------------|-------|-------|--------------------------------------------------------------------------------------------------------------------------------|
| Student Laboratory Assistants              | 30.00 | 11.50 | Cleaning laboratories, cleaning glassware, assisting Coordinator, Science Labs and Science Laboratory Instructional Assistant. |
| STNC - Chem Science Lab Instructional Asst | 25.00 | 9.50  | An STNC is currently working at both the Petaluma campus (2 days per week) and the Santa Rosa campus (2 days per week)         |
| STNC - Phys Science Lab Instructional Asst | 15.00 | 9.00  | An STNC is currently covering labs not covered by the Physics SLIA.                                                            |

## 2.2d Adequacy and Effectiveness of Staffing

### CHEMISTRY

The Chemistry program requests a new full time SLIA position to be shared between the Santa Rosa and Petaluma campuses. For the past four years, we have been using an STNC SLIA to staff chemistry labs in Petaluma and backfill additional needs in Santa Rosa. The STNCs have had their hours cut back in recent years due to the Affordable Care Act, and that has limited the hours the STNC can work to 25 hours per week. We are not able to expand our offerings in Petaluma by adding sections of new courses because of this lack of lab support. In Santa Rosa, we require additional support because of additional sections and Saturday classes that we have added to our schedule. The non-temporary nature of this work requires a permanent classified employee.

### PHYSICS

In order to adequately staff the current Physics program, a full time Science Lab Instructional Assistant (SLIA) is needed. Any remaining labs should be covered by a part time SLIA. If the Physics program continues to expand, it is possible that two full time SLIAs will be needed.

The Physics Program requests a permanent increase in the physics lab technician's hours from 50% to 100%. For the past two years, the Physics Science Lab Tech has been working under a temporary promotion to a full time SLIA. The total number of Physics labs offered has more than doubled in recent years, and without a SLIA working full time, there is no way those labs

can be supported. Running the Physics labs without the presence of a technician is not possible due to equipment failure and software malfunctions.

Since Fall 2013, we have employed an STNC/SLIA for the physics lab for 20 hours per week. Even with this additional help we still have labs that are not covered by the lab technician or the STNC.

Due to the technical nature of the Physics lab equipment, set up and repair, we have found having a temporary STNC help is not beneficial due to a very slow learning curve required for an individual to become familiar with the program.

With additional lab offerings in the summer, there is an urgent need for an additional 25 hours of SLIA support.

## 2.2e Classified, STNC, Management Staffing Requests

| Rank | Location   | SP | M  | Current Title                                     | Proposed Title                              | Type       |
|------|------------|----|----|---------------------------------------------------|---------------------------------------------|------------|
| 0001 | Santa Rosa | 00 | 00 | Science Laboratory Instructional Asst, 20hrs STNC | Science Lab Instruc Asst: FT 50/50 SR&Pet   | Classified |
| 0001 | Santa Rosa | 00 | 00 | Physics Science Lab Technician, 50%               | Physics Science Lab Instruc Asst, 100%      | Classified |
| 0002 | Santa Rosa | 00 | 00 | Physics Science Lab Instruc Asst, 15hrs STNC      | Science Lab Instruc Asst,10m (50/25 SR&Pet) | Classified |

## 2.3a Current Contract Faculty Positions

| Position                           | Description                                                                                                                                                                   |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Full Time Chemistry Instructor (7) | The Chemistry program currently has seven full-time instructors. One is assigned on a rotating basis to the Petaluma campus, and one is on 80% resassign time for AFA duties. |
| Full Time Physics Instructor (3)   | The physics program currently has three full-time instructors.                                                                                                                |

## 2.3b Full-Time and Part-Time Ratios

| Discipline | FTEF Reg | % Reg Load | FTEF Adj | % Adj Load | Description                                                                                                                                                                                                             |
|------------|----------|------------|----------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chemistry  | 5.5300   | 49.5000    | 5.6400   | 50.4900    | This year, 2014-2015, we have 6 full time faculty, one of whom is teaching only 53%, resulting in 5.6 FTEF for Regular faculty. We currently employ 2 adjunct faculty in Petaluma, and 8 adjunct faculty in Santa Rosa. |
| Physics    | 2.0000   | 46.5000    | 2.3000   | 53.5000    | This year, 2014-2015, we have 3 full time faculty (1 is on sabbatical S15/F15, and 1 is due to retire at the end of F15). We currently employ 6 adjunct faculty.                                                        |

### 2.3c Faculty Within Retirement Range

The Chemistry program does not anticipate any retirements in the next three years.

One of the three current Physics faculty will retire at the end of Fall 2015.

### 2.3d Analysis of Faculty Staffing Needs and Rationale to Support Requests

#### PHYSICS:

We request one full-time faculty position to meet student demand for physics courses. Maintaining an adequate number of full-time faculty is essential to the function of the Physics transfer program and the success of all STEM majors.

With the addition of our new full time faculty member who will begin teaching in Fall 2015 and the impending retirement of another full time faculty member, we remain at the current level of three full time Physics instructors. Student demand for Physics classes has increased greatly over the past decade, and we are now offering sections of all of the physics courses each semester. Even so, we are still short of meeting current demand and see a need to offer more sections. In the past several semesters, students have written petitions and contacted the Dean, Vice President, and President to ask for additional sections. Due to a lack of adjunct instructors (despite opening the pool every year), contract faculty had to take on additional overload in order for the program to offer these extra sections.

With higher enrollments across all STEM fields requiring physics courses, we project that a substantial increase in course offerings is necessary to meet demand. The Physics program has made an effort to accommodate students by offering transfer-level physics courses in summer sessions and on weekends, but more sections are needed. In addition, to bolster student success in our calculus-based series, we plan to require successful completion of PHYS1 before enrolling in PHYS40, which would increase staffing needs. We also plan to expand Physics offerings in Petaluma and develop online and hybrid courses. Without an additional full-time faculty member, it will be difficult to grow the program to the level needed to serve our students.

The Physics program has maintained an adjunct staff of six instructors this past year, but attracting and keeping high quality adjuncts is difficult due to a lack of professional physicists in the area. In addition, adjuncts are not required to perform college service. Therefore, merely increasing our adjunct staffing to meet course demands would not contribute to other aspects of running a successful Physics program.

### 2.3e Faculty Staffing Requests

| Rank | Location   | SP | M  | Discipline | SLO Assessment Rationale                                                                                                                                                                                                                                                                                                                                                                                                 |
|------|------------|----|----|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0001 | Santa Rosa | 02 | 01 | Physics    | Maintaining a high quality of instruction to meet the SLOs for the Physics program requires a level of dedication and student contact that is not expected from our adjunct instructors. This includes conducting undergraduate research, participating in clubs, curriculum assessment, grant writing, local events (i.e. DUO), and building relationships with local industry and four-year institutions, such as SSU. |

## 2.4b Rational for Instructional and Non-Instructional Equipment, Technology, and Software

\*\*\*Please note that the Physics instructional equipment list is ranked separately and listed below the Chemistry list. The Physics requests are numbered 0101, 0102, and so on, according to their rankings within the program.\*\*\*

Justification for items on the Instructional Equipment Request spreadsheet:

- (1) The Petaluma campus Chemistry lab currently does not have any spectrophotometers. These units would be crucial for introducing Chem 42 labs in Petaluma.
- (2) These transformers would replace the outdated bulky units that we currently use for Chem 12A/B. They are much easier for the students to use and take up much less bench space thereby increasing safety.
- (3) This is a request for replacement of student computer (laptop) workstations in the Petaluma lab. The current units are from 2004 are still running the outdated Windows XP operating system.
- (4) The laser printer would be shared by the student workstations in item # 3 above and allow students to print results for the lab reports.
- (5) These sampling systems would allow inclusion of experiments utilizing measurement of light absorption in the UV light range. We currently have 7 units but 5 need lamp replacements.
- (6) These spectrophotometers would be used primarily for Chem 42 but could also be used in Chem 1A/1B. This would give the department 2 class sets of visible range spectrophotometers and allow the simultaneous scheduling of experiments using these units.
- (7) These hotplate/stirrers would serve as back-up units for the 56 units that we currently use in 2 of our instructional labs. The units are used in almost half of all experiments offered in the department.
- (8) This request is for interfaces and sensors for the laptops in item # 3 to allow computerized data acquisition in the Petaluma lab with sensors such as temperature, pH, and voltage. They would primarily be needed for Chem 42.
- (9) These gas chromatographs would replace the 2 units that were purchased in 1984 and are very much near the end of their useful lifetime. Many issues are creeping up with the existing units and they no longer represent the latest technology that a student would use in other labs.
- (10) These aspirator pumps would be used to replace the water aspirators that are used to create suction of vacuum filtration experiments. By recirculating the water used, the department could save about 30,000 gallons of water per year going down the drain. We currently have 4 units and they are working well.
- (11) These polarimeters would replace 2 of the existing units that are near the end of their useful lifetime. We can no longer purchase parts for the old instruments and these replacement units are inexpensive and easy to operate.
- (12) This request is for an additional presentation system to supplement the current one that we have so that 2 faculty can be using them at the same time.
- (13) This balance would be used as a back-up for the 10+ analytical balances that are crucial to our program.
- (14) The High-Performance Liquid Chromatography system is a brand new instrument that will expose students to a very important data collection technique that they will likely see in their future careers. The instrument is used to separate and analyze non-volatile samples such as drugs, proteins, and other biological chemicals.

(15) X-Ray Fluorescence Analyzer is also a brand new instrument that will expose students to a very important data collection technique that they will likely see in their future careers. The instrument is rapidly becoming the industry standard for elemental analysis.

What is the highest priority for equipment over the next three years?

Replace critical instruments before they cease to operate.

Have you found any way(s) to share equipment with other programs/units and/or to save money repairing or repurposing equipment? If so, explain.

Our department has always had a good attitude about sharing resources across programs. Within our department, the Chemistry and Physics programs share resources and we routinely work Life Sciences to share not only equipment, but also staff knowledge. We have in the past and are currently hosting in our labs part of a Wine 55A/55B (Laboratory Analysis of Wines) class offered through Agriculture/Natural Resources. This involves taking on much of the preparation as if it were one of our normal chemistry lab classes. Last year, we also purchased together with Life Sciences a new ice machine when our existing unit was no longer usable.

With regard to repairing equipment we have always done our best to repair any of our equipment in house prior to going to an outside repair option. We have a good track record of repairing and maintaining our equipment to ensure a long and useful life. However, we are slowly beginning to see a backlog of unrepaired equipment. Hiring an additional SLIA would improve this situation.

Justification for items on the Instructional Equipment Request spreadsheet:

#### Chemistry Program

- (1) These transformers would replace the outdated bulky units that we currently use for Chem 12A/B. They are much easier for the students to use and take up much less bench space thereby increasing safety.
- (2) This is a request for replacement and expansion of our student computer (laptop) workstations in the Petaluma lab. The request has been made to ITG as well.
- (3) This request is for interfaces and sensors for the laptops in item #2 to allow computerized data acquisition in the Petaluma labs. This would primarily be needed for Chem 42 to be offered in Petaluma.
- (4) These spectrophotometers would be used primarily for Chem 42 but could also be used in Chem 1A/1B. This would give the department 2 class sets of visible range spectrometers and allow the simultaneous scheduling of 2 experiments using spectrometers.
- (5) These lamps would allow inclusion of experiments utilizing measurement of light absorption in the UV light range. They would attach to our existing spectrometers and would supplement our existing 7 UV lamps to create a full class set of UV-enabled spectrophotometers.
- (6) These hotplate/stirrers would serve as back-up units for the 56 units that we currently use in 2 of our instructional labs. The units are used in almost half of all experiments offered in the department.
- (7) These gas chromatographs would replace the 2 units that were purchased in 1984 and are very much near the end of their useful lifetime. Many issues are creeping up with the existing units and they no longer represent the latest technology that a student would use in other labs.
- (8) These aspirator pumps would be used to replace the water aspirators that are used to create suction of vacuum filtration experiments. By recirculating the water used, the department could save about 30,000 gallons of water per year going down the drain. We currently have 4 units and they are working well.

(9) These polarimeters would replace 2 of the existing units that are near the end of their useful lifetime. We can no longer purchase parts for the old instruments and these replacement units are inexpensive and easy to operate.

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(11) This balance would be used as a back-up for the 10+ analytical balances that are crucial to our program.

(12) The High-Performance Liquid Chromatography system is a brand new instrument that will expose students to a very important data collection technique that they will likely see in their future careers. The instrument is used to separate and analyze non-volatile samples such as drugs, proteins, and other biological chemicals.

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With regard to repairing equipment we have always done our best to repair any of our equipment in house prior to going to an outside repair option. We have a good track record of repairing and maintaining our equipment to ensure a long and useful life. However, we are slowly beginning to see a backlog of unrepaired equipment. Hiring an additional SLIA would improve this situation.

We also have a good track record of repurposing equipment. If there is any useful life in something that we have the opportunity to replace, we will seek to place the item within our cluster, the District, or when possible to donate the equipment to local public high schools.

### Physics Program

An essential component of physics instruction is the ability for students to conduct laboratory experiments. This requires a significant investment in dedicated instructional equipment for our physics lab. Equipment breaks and becomes obsolete and we strive to use our meager supplies budget to maintain or replace as much as we can. Allocation of instructional equipment money each year is also essential to replace equipment that is 30 or more years old.

As an example, when our top request was not funded, the department had no option but to eliminate thermal expansion labs from all our offerings. This particular set of equipment is very old and poses safety concerns (scalding from steam). The new system still has hot components

but the steam scalding issue is lessened. Combined with the Thermocouple probes from Vernier this lab can be safely offered as a laboratory exercise in the Physics Lab. The quality of our curriculum suffered because funding is not available to maintain the safety of the physics equipment.

The Lab chairs on the PRPP list would solve a safety and replacement issue at the same time. The Bases on the current lab chairs are a wide five leg non-rolling base design. The legs when combined with the narrow rows in the Physics Laboratory are a tripping hazard when trying to move around the laboratory. The chairs are in a state of repair that require a lot of maintenance to keep them operational.

The rest of the items listed in the tables are replacement orders for the broken ones.

## 2.4c Instructional Equipment and Software Requests

| Rank | Location   | SP | M  | Item Description                                   | Qty | Cost Each   | Total Cost  | Requestor                  | Room/Space  | Contact       |
|------|------------|----|----|----------------------------------------------------|-----|-------------|-------------|----------------------------|-------------|---------------|
| 0001 | Petaluma   | 01 | 01 | Spectrophotometers, Vernier SpectroVis Plus        | 15  | \$500.00    | \$7,500.00  | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0002 | Santa Rosa | 01 | 01 | Variable Transformer, Glas-Col MiniTrol 12A, 120V  | 12  | \$200.00    | \$2,400.00  | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0003 | Petaluma   | 01 | 01 | Lab Computers for Data Acquisition                 | 16  | \$400.00    | \$6,400.00  | Karen Frindell<br>Teuscher | PC208       | Bill Cusworth |
| 0004 | Petaluma   | 01 | 01 | Laser Printer, black and white                     | 1   | \$500.00    | \$500.00    | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0005 | Santa Rosa | 01 | 01 | Ocean Optics Direct Attach integrated sys UV-VIS   | 7   | \$1,800.00  | \$12,600.00 | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0006 | Santa Rosa | 01 | 01 | Spectrophotometers, Vernier SpectroVis Plus        | 15  | \$500.00    | \$7,500.00  | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0007 | Santa Rosa | 01 | 01 | Corning PC-420D Hotplate Stirrer                   | 6   | \$500.00    | \$3,000.00  | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0008 | Petaluma   | 01 | 01 | Vernier Instrumentation Interface w/Sensor Pkg     | 15  | \$500.00    | \$7,500.00  | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0009 | Santa Rosa | 01 | 01 | Gas Chromatograph, Packed/Capillary Column         | 2   | \$9,000.00  | \$18,000.00 | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0010 | Santa Rosa | 01 | 01 | Circulating Water Aspirator                        | 8   | \$1,200.00  | \$9,600.00  | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0011 | Santa Rosa | 01 | 01 | Polarimeter, Vernier                               | 2   | \$550.00    | \$1,100.00  | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0012 | Santa Rosa | 01 | 01 | Visual Presentation System (ELMO P30S)             | 2   | \$3,000.00  | \$6,000.00  | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0013 | Santa Rosa | 01 | 01 | Balance, Analytical, Ohaus Discovery               | 1   | \$3,000.00  | \$3,000.00  | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0014 | Santa Rosa | 01 | 01 | High-Performance Liquid Chromatography System      | 1   | \$13,000.00 | \$13,000.00 | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0015 | Santa Rosa | 01 | 01 | X-Ray Fluorescence Analyzer                        | 1   | \$32,000.00 | \$32,000.00 | Karen Frindell<br>Teuscher | Bech Hall   | Bill Cusworth |
| 0101 | Santa Rosa | 01 | 01 | Chairs 23 UUsery 21"-26" for Classroom             | 26  | \$249.50    | \$6,487.00  | Karen Frindell<br>Teuscher | Shuhaw 1782 | Greg Davis    |
| 0102 | Santa Rosa | 01 | 01 | Thermal Expansion Apparatus 3B Scientific 1000830  | 13  | \$320.00    | \$4,160.00  | Karen Frindell<br>Teuscher | Shuhaw 1782 | Greg Davis    |
| 0103 | Santa Rosa | 01 | 01 | Function Generator, Pasco PL-9587C                 | 2   | \$750.00    | \$1,500.00  | Karen Frindell<br>Teuscher | Shuhaw 1782 | Greg Davis    |
| 0104 | Santa Rosa | 01 | 01 | Diode Lasers OS-8525A Pasco                        | 3   | \$199.00    | \$597.00    | Karen Frindell<br>Teuscher | Shuhaw 1782 | Greg Davis    |
| 0105 | Santa Rosa | 01 | 01 | Rotating Cross Arm Table, Sargent Welch CP24484-00 | 2   | \$630.00    | \$1,260.00  | Karen Frindell<br>Teuscher | Shuhaw 1782 | Greg Davis    |
| 0106 | Santa Rosa | 01 | 01 | Spectrum Lamp Power Supplies Arbor Scientific      | 3   | \$210.00    | \$630.00    | Karen Frindell<br>Teuscher | Shuhaw 1782 | Greg Davis    |

## 2.4d Non-Instructional Equipment, Software, and Technology Requests

| Rank | Location | SP | M | Item Description | Qty | Cost Each | Total Cost | Requestor | Room/Space | Contact |
|------|----------|----|---|------------------|-----|-----------|------------|-----------|------------|---------|
|------|----------|----|---|------------------|-----|-----------|------------|-----------|------------|---------|

## 2.5a Minor Facilities Requests

| Rank | Location | SP | M | Time Frame | Building | Room Number | Est. Cost | Description |
|------|----------|----|---|------------|----------|-------------|-----------|-------------|
|------|----------|----|---|------------|----------|-------------|-----------|-------------|

## 2.5b Analysis of Existing Facilities

The Chemistry department on the Santa Rosa Campus is located in Bech Hall. The facility includes:

- Two 88-person lecture halls and one 30-person seminar room equipped with new computer/video projection systems and network connections. The halls also have tables designed for use by students with disabilities and assistive audio systems for students with hearing impairment.
- Two 28-person general chemistry labs with a shared analytical balance room. Each general chemistry lab is equipped with 14 computer workstations and four fume hoods. The balance room houses 13+ electronic analytical balances for student use.
- One 26-person organic chemistry with an adjacent instrument room. The lab is equipped similarly to the general chemistry labs, and the instrument room has most of the large instruments in the department. The stools for this laboratory are stored in stacks in the front of the room. A separate storage space or solution is needed to clear this space.
- A portable laboratory station for use by students with disabilities is available for students who need accommodation in the laboratory. However, the unit is too big, and a disabled student has no easy access to fume hoods in the laboratories.
- A stockroom with storage space for laboratory equipment and chemicals, and limited space for preparing and staging materials for laboratory experiments, which are kept on carts and moved into to the laboratory just before each lab period. The stockroom has very limited (approx. 90 sq. ft) office space for two full-time stockroom employees and a number of part-time student workers.
- Seven offices for full-time faculty.
- A new space is needed for students to be able to work and study together. Currently, students are confined to the hallways and entryway of the building when not in class.
- A departmental office with space for our administrative assistant, mailboxes, a conference table for meetings, office supplies storage and most of our office equipment. A separate conference/break room for meetings would allow for more flexibility in the use of this space. Perhaps this space could serve as a combined conference room/student work area.
- An equipment room behind the instrument room which is currently used for storage and for administering exams.

- Six storage closets, two used for lab stool storage, two for equipment, and two for utilities/custodial supplies.
- One toilet for staff use.
- There are no student restrooms in the building. Student restrooms are needed.
- The building has no air conditioning outside of the lecture halls. During hot weather, students lab goggles fog up and students tend to remove them, creating an ongoing laboratory safety issue.

The Chemistry Department is located in Bech Hall, a sixteen-sided, 12,000 square-foot building that is now forty years old. The facility is showing its age and is at its maximum carrying capacity, yet the staff maintains it with great pride. The Department is anticipating the future construction of a new science building which will alleviate the space constraints felt in the stockroom, adjunct faculty office, department office/conference room, student study areas and laboratories, as well as provided needed upgrades to restroom availability, HVAC, and natural light availability. Nonetheless, given that a new building is still in the distant future, there are a number of improvements that can be made now to the current facility that will improve it in a worthwhile way.

On the Petaluma campus, the Chemistry laboratory is in Kathleen Doyle Hall. It has lab space for 27 students per section. We offer 4 sections of Chemistry 60 at Petaluma. There is an adjacent stockroom, which has some access issues. Instructors are forced to enter the classroom through the stockroom, which is not good practice. Instructors should be provided with a key to the classroom, preventing the need to walk through a chemical storage area when unnecessary and without safety glasses. This especially applies to instructors who are not trained in hazardous materials safety.

There is only a single fume hood in the Chemistry laboratory. More advanced Chemistry classes require one fume hood for every three students. The Chemistry lecture classes in Petaluma are taught in whichever classrooms are available, usually in Doyle hall.

The Physics program offers classes in Shuhaw Hall.

The two primary physics lecture rooms (1783 & 1786) are in desperate need of an upgrade to the 30+ year old chairs. Each semester, chairs break and need to be repaired. Some have been removed and not replaced. All of them fail to meet the current needs of our students who must use notebooks, textbooks and calculators all at the same time. The small & sloped "steno pad" size desks are not adequate for this purpose. Students juggle their materials with stuff in their laps, on the floor, and on the adjacent desks if possible. Collaborative learning is an important element in all our classes and this is greatly hampered by the fixed spacing and cluttered environment.

The Engineering, Physics and Math programs, along with several other programs use a 50 year old building that is gradually falling apart. The infrequent upgrades and renovations have not kept pace with the needs of our programs.

The Physics program is impacted and could make use of a second laboratory. Currently, all Physics courses are taught in a single room, making it difficult to schedule simultaneous or overlapping sections of any Physics classes. This limits options for students and makes it difficult to provide adequate lab support.

### 3.1 Develop Financial Resources

The Chemistry and Physics programs are interested in grants that will help us update and add to the instrumentation and equipment we use in our laboratory curriculum. We are also seeking funding and assistance for expanding our program in Petaluma.

### 3.2 Serve our Diverse Communities

The Department continues to support a diverse workforce. The Department follows all procedures and guidelines set forth by Human Resources in the hiring of faculty and staff.

### 3.3 Cultivate a Healthy Organization

The Department of Chemistry and Physics fully embraces the professional development of all members of the department including classified staff. We would like to develop more discipline specific workshops for FLEX and on PDA Day.

### 3.4 Safety and Emergency Preparedness

The Chemistry safety leaders are Joe Fassler and Bill Cusworth (Bech Hall), and the Physics safety leader is Greg Davis (Shuhaw).

### 3.5 Establish a Culture of Sustainability

The greatest potential for a direct environmental impact of the Department of Chemistry and Physics arises from its Chemistry laboratory instruction program. To that effect, the Chemistry program is deeply committed to teaching labs that are safe and achieve the desired learning outcomes while minimizing the use of toxic, dangerous, rare, and/or expensive chemicals. Whenever possible, any environmentally risky experiments are performed on a microscale, which uses less than a 1/100 of the resources used by more traditional experiments. Even the more benign experiments are conducted on the smallest scale that is practical, in order to preserve natural resources and minimize cost.

As a department, we continue to make significant improvements in the area of reducing the amount of paper we use. We proactively work with textbook publishers to minimize the number of textbook desk copies sent to the individual instructors. A majority of the instructors assign online homework instead of collecting paper copies; all student handouts (syllabus, reading assignments) are shared with students electronically. The only mass printing is done for exams and, currently, about 50% of those are copied double sided.

### 4.1a Course Student Learning Outcomes Assessment

#### CHEMISTRY

The Chemistry Department started its first six-year cycle of assessment in Fall 2010. Since then, all outcomes in all courses have been assessed multiple times, with the exception of one outcome in one course, which will be completed in Fall 2015. The next six-year cycle will begin in Fall 2016.

#### Summary of Chemistry Program SLO assessments

|         | SLOs assessed since Fall 2010 | Total SLOs | Done Until Fall 2016 | Needed |
|---------|-------------------------------|------------|----------------------|--------|
| Chem 1A | 1, 2, 3                       | 3          | YES                  | none   |
| Chem 1B | 1, 2, 3, 4                    | 4          | YES                  | none   |
| Chem 4A | 1, 2, 3, 4                    | 4          | YES                  | none   |
| Chem 4B | 1, 2, 3, 4                    | 5          | YES                  | none   |

|          |            |   |     |      |
|----------|------------|---|-----|------|
| Chem 12A | 1, 2       | 2 | YES | none |
| Chem 12B | 1, 2       | 2 | YES | none |
| Chem 42  | 1, 2, 3, 4 | 4 | YES | none |
| Chem 60  | 1, 2, 3, 4 | 4 | YES | none |
| Chem 8   | 2, 3, 4    | 4 |     | 1    |
| Chem 100 | 1,2, 3     | 3 | YES | none |

The Chemistry faculty continue to discuss these assessments and use them to improve our teaching and curriculum.

## PHYSICS

The Physics program started its first six-year cycle of assessment in Fall 2013. All courses have had at least one outcome assessed. The faculty will assess the remaining outcomes over the next several semesters. The next six-year cycle will begin in Fall 2019.

### Summary of Physics Program SLO assessments

| SLOs assessed since Fall 2013 |            | Total SLOs | Done Until Fall 2019 | Needed |
|-------------------------------|------------|------------|----------------------|--------|
| PHYS 1                        | 1          | 4          |                      | 3      |
| PHYS 11                       | 1,2        | 2          | YES                  | none   |
| PHYS 20                       | 2          | 2          |                      | 1      |
| PHYS 20L                      | 2          | 2          |                      | none   |
| PHYS 21                       | 2          | 2          | YES                  | none   |
| PHYS 21L                      | 1          | 2          |                      | 1      |
| PHYS 40                       | 1, 2, 3, 4 | 4          | YES                  | none   |
| PHYS 41                       | 1, 2       | 4          |                      | 2      |
| PHYS 42                       | 1, 2, 3, 4 | 4          | YES                  | none   |
| PHYS 43                       | 1          | 3          |                      | 2      |

The Physics faculty continue to discuss these assessments and use them to improve our teaching and curriculum.

## 4.1b Program Student Learning Outcomes Assessment

### Program-level Student Learning Outcomes – Chemistry Major (Assessed Fall 2014)

A successful Chemistry major matriculating from the SRJC Chemistry Department will be able to

1. relate observable phenomena to molecular events according to prevailing chemical theories.
2. identify, synthesize, and predict and explain the structure of a variety of compounds, both inorganic and organic.
3. accurately and safely obtain and analyze data from experimental sources, including traditional laboratory methods, computer-interfaced data collection devices, and advanced analytical instrumentation.
4. use critical thinking skills to analyze “real-world” applications of chemical knowledge and theories.
5. communicate effectively the results of laboratory experiments, including error analysis.

We will assess these program outcomes through the assessment of Chem 12B, the program's capstone course.

#### **Program-level Student Learning Outcomes –Physics and Physics-T Major (Assessed Spring 2015)**

1. Apply physical principles from the basic subfields of physics (classical mechanics, electricity and magnetism, quantum mechanics, statistical mechanics, and thermodynamics), as well as areas from application (e.g. solid state physics, optics, etc.) in advanced courses;
2. apply physical principles to novel situations through critical thinking, problem solving, mathematical modeling, and laboratory experimentation.
3. design and assemble experimental apparatuses, conduct and analyze measurements of physical phenomena, assess experimental uncertainty, and make meaningful comparisons between experiment and theory; and
4. communicate ideas and processes of physics clearly and precisely, both orally and in writing.

#### 4.1c Student Learning Outcomes Reporting

| Type   | Name     | Student Assessment Implemented | Assessment Results Analyzed | Change Implemented |
|--------|----------|--------------------------------|-----------------------------|--------------------|
| Course | Chem 100 | Fall 2010                      | Spring 2011                 | N/A                |

|        |                                |             |             |             |
|--------|--------------------------------|-------------|-------------|-------------|
| Course | Chem 12A                       | Fall 2010   | Spring 2011 | N/A         |
| Course | Chem 1A                        | Fall 2010   | Spring 2011 | N/A         |
| Course | Chem 1B                        | Fall 2010   | Spring 2011 | N/A         |
| Course | Chem 42                        | Fall 2010   | Spring 2011 | N/A         |
| Course | Chem 4A                        | Fall 2010   | Spring 2011 | N/A         |
| Course | Chem 60                        | Fall 2010   | Spring 2011 | N/A         |
| Course | Chem 8                         | Fall 2010   | Spring 2011 | N/A         |
| Course | Chem 100                       | Fall 2011   | Spring 2012 | N/A         |
| Course | Chem 12A                       | Fall 2011   | Spring 2012 | N/A         |
| Course | Chem 12A                       | Spring 2011 | Summer 2011 | N/A         |
| Course | Chem 12B                       | Fall 2011   | Spring 2012 | N/A         |
| Course | Chem 12B                       | Spring 2011 | Summer 2011 | N/A         |
| Course | Chem 1A                        | Spring 2011 | Summer 2011 | N/A         |
| Course | Chem 1A                        | Fall 2011   | Spring 2012 | N/A         |
| Course | Chem 1B                        | Fall 2011   | Spring 2012 | N/A         |
| Course | Chem 1B                        | Spring 2011 | Summer 2011 | N/A         |
| Course | Chem 42                        | Spring 2011 | Summer 2011 | N/A         |
| Course | Chem 42                        | Fall 2011   | Spring 2012 | Spring 2011 |
| Course | Chem 4A                        | Fall 2011   | Spring 2012 | Spring 2011 |
| Course | Chem 4B                        | Spring 2011 | Summer 2011 | N/A         |
| Course | Chem 60                        | Spring 2011 | Summer 2011 | N/A         |
| Course | Chem 60                        | Fall 2011   | Spring 2012 | N/A         |
| Course | Chem 8                         | Spring 2011 | Summer 2011 | N/A         |
| Course | Chem 8                         | Fall 2011   | Spring 2012 | Spring 2011 |
| Course | Chem 100                       | Spring 2012 | Summer 2012 | N/A         |
| Course | Chem 1A                        | Spring 2012 | Summer 2012 | N/A         |
| Course | Chem 1B                        | Spring 2012 | Summer 2012 | N/A         |
| Course | Chem 42                        | Spring 2012 | Summer 2012 | N/A         |
| Course | Chem 4A                        | Fall 2012   | Spring 2013 | N/A         |
| Course | Chem 4B                        | Spring 2012 | Summer 2012 | N/A         |
| Course | Chem 60                        | Spring 2012 | Summer 2012 | N/A         |
| Course | Chem 8                         | Spring 2012 | Summer 2012 | N/A         |
| Course | Chem 4B                        | Spring 2013 | N/A         | N/A         |
| Course | Chem 8                         | Spring 2013 | N/A         | N/A         |
| Course | Phys 1 Physics Problem Solving | Spring 2014 | Spring 2014 | N/A         |
| Course | Phys 11 Descriptive Physics    | Fall 2014   | Fall 2014   | N/A         |
| Course | Phys 20 General Physics Part I | Spring 2014 | Spring 2014 | N/A         |
| Course | Phys 20L                       | Spring 2014 | Spring 2014 | N/A         |
| Course | Phys 21 General Physics Part 2 | Spring 2014 | Spring 2014 | N/A         |
| Course | Phys 21L                       | Summer 2013 | Summer 2013 | N/A         |
| Course | Phys 40                        | Fall 2013   | Fall 2013   | N/A         |
| Course | Phys 41 Waves, Optics, Thermo  | Spring 2014 | Spring 2014 | N/A         |
| Course | Phys 42 Electricity and Magnet | Spring 2014 | Spring 2014 | N/A         |
| Course | Phys 43 Modern Physics         | Fall 2014   | Fall 2014   | N/A         |

#### 4.2a Key Courses or Services that address Institutional Outcomes

| Course/Service         | 1a | 1b | 1c | 2a | 2b | 2c | 2d | 3a | 3b | 4a | 4b | 5 | 6a | 6b | 6c | 7 |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|---|----|----|----|---|
| Chem 12A/B             | X  | X  | X  |    |    |    |    | X  |    | X  | X  | X |    |    |    | X |
| Chem 1A/B              | X  | X  | X  |    |    |    |    | X  |    | X  | X  | X |    |    |    | X |
| Chem 42                | X  | X  | X  | X  |    |    | X  | X  |    | X  | X  | X | X  |    |    | X |
| Chem 4A/B              | X  | X  | X  |    |    |    |    | X  |    | X  | X  | X |    |    |    | X |
| Chem 5                 | X  | X  | X  |    |    |    |    | X  |    | X  | X  | X |    |    |    | X |
| Phys 1                 | X  |    |    | X  | X  |    | X  | X  |    | X  | X  |   |    |    |    |   |
| Phys 10/10L or Phys 11 | X  |    | X  |    |    |    |    | X  | X  |    | X  | X |    |    |    | X |
| Phys 20, 20L, 21, 21L  | X  | X  |    |    | X  |    |    |    |    | X  |    |   |    |    |    |   |
| Phys 40, 41, 42,43     | X  | X  |    |    | X  |    |    |    |    | X  |    |   |    |    |    |   |

## 4.2b Narrative (Optional)

## 5.0 Performance Measures

Not applicable.

## 5.1 Effective Class Schedule: Course Offerings, Times, Locations, and Delivery Modes (annual)

### CHEMISTRY

The Chemistry program is offering a schedule that is as balanced and convenient as possible, given the constraints of the facility and staffing. Bech Hall has three laboratories, which limits the number of lab sections that we can schedule. On the Petaluma Campus the Chemistry Department is limited by the fact that the laboratory facility is only suitable for one of our courses.

In 2009, the Chemistry department created a rotation plan to ensure that students will be able to get through our program in a timely manner. For example, our summer offerings are designed to enable students who need all five semesters of our program to finish the program in two years. We

also offer an evening sequence for the first three semesters as well as for Chem 60. We are offering a Saturday section of Chem 42 as well. Lately, the problem has been that all sections of our core program courses have been filling up soon after registration opens. It appears that we could add more sections of Chem 42, Chem 1A, Chem 1B, and Chem 60 each semester and they would fill, and only be limited by lack of space or staffing.

## PHYSICS

The Physics program offers the standard slate of physics courses to meet the basic needs of SRJC's students. These courses are offered on the Santa Rosa campus and almost exclusively during the day to full time students.

Bio engineering and biomedical engineering are areas of increasing demand from students and industry. There are ideas to develop a nano-technology materials/physics course and a new intro to Physics. In the past, chronic understaffing (faculty and technical support staff) made growing our program and responding to curricular changes increasingly difficult. With the current increase of lab support and close cooperation with the Chemistry department, we are hoping to be able to start developing new courses.

The Physics program is in contact with Petaluma campus for offering non-lab Physics course, PHYS1, or hybrid courses (with lab at SRJC campus) PHYS11, PHYS20 and PHYS21.

Due to the nature of physics courses, challenging material requiring one on one interaction between the instructor and the student, currently we are not offering any online courses. Phys 11 (GE, conceptual physics) has been targeted as a possible online (or hybrid) course.

### Student Headcount

X10: 28 F10: 312 S11: 506 X11: 33 F11: 343 S12: 473 X12: 0 F12: 315 S13: 423 X13: 69 F13: 403

## 5.2a Enrollment Efficiency

The Chemistry Department's average enrollment efficiency is well over 100%, exceeding the district goal of 90%. Chem 60, Chem 42, Chem 1A, Chem 1B, Chem 12A and Chem 100 sections are traditionally filled to the maximum (or beyond) by first census; this helps maintain the average efficiency at close to 100%. STEM courses continue to be in high demand, even as the enrollment in other courses is declining. The only way to alleviate the efficiencies that are >100% is to offer more sections, which could prove difficult due to the limited number of faculty and limited lab facilities.

| <b>Enrollment Efficiency</b> | <b>Chemistry</b> |
|------------------------------|------------------|
| F13                          | 112.9%           |
| S13                          | 114.7%           |
| F12                          | 108.8%           |

## PHYSICS

The Physics program's enrollment efficiency has surged over the past 3 years. Our program is at or above capacity in all sections. We fill classes very early in registration and end up turning many students away. We offer only one section each semester or each year of many of our classes and they are required for transfer students. Frequently, faculty are going well beyond the class limits to accommodate students that need the classes for their transfer major, to the detriment of instructional quality and also causing a substantial increase in uncompensated workload.

### ALL Locations Enrollment Efficiency

|      |       |        |        |        |        |        |       |        |        |       |       |
|------|-------|--------|--------|--------|--------|--------|-------|--------|--------|-------|-------|
| Disc | X2010 | F2010  | S2011  | X2011  | F2011  | S2012  | X2012 | F2012  | S2013  | X2013 | F2013 |
| Phys | 93.3% | 136.8% | 135.0% | 110.0% | 140.2% | 111.8% | 0.0%  | 115.4% | 110.2% | 71.9% | 97.6% |

Data from "Physics\_FY2010-11\_Acad" shows a continuous increase in the number of students taking Physics classes based on the following statistics for the Fall-Spring-Summer academic years:

| Academic year | Total number of students |
|---------------|--------------------------|
| 2008-2009     | 667                      |
| 2209-2010     | 785                      |
| 2010-2011     | 840                      |
| 2011-2012     | 849                      |
| 2012-2013     | 738                      |

## 5.2b Average Class Size

The average class size for courses in the Chemistry Department has been consistent over the last five years. This trend will very likely continue in the coming years. As mentioned in 5.1, the department is bound to the confines of the building and available laboratory stations to meet safety requirements. Our laboratory facilities limit us to a maximum of between 20 and 28 students per section, depending on the room and the course.

| Average Class Size | Chemistry |
|--------------------|-----------|
| F13                | 26.2      |
| S13                | 26.8      |
| F12                | 25.6      |

## PHYSICS

Average class sizes have grown significantly over the past three years as our enrollment has gone from solid to overflowing. All our physics classes are at or above capacity and most fill very early in the registration process. We turn students away from almost all our classes thus delaying their ability to meet their transfer goals.

**It is important to note that average class size as calculated by the system is not an accurate measure of the Physics program's enrollment efficiency. Phys 41 and 42 have two lectures and 3 labs each. To create all possible combinations of lab/lecture, we end up with 6 sections for each course, although more than half are un-loaded. Average class size records 6 sections at 12 students even if each lecture has 36 and each lab has 24.**

**As an example, the system reported class size for the Fall 2011 is 18. This number needs to be adjusted according to the following reported enrollment numbers at census day: Lectures:**

| Course | Number of sections | total enrollment |
|--------|--------------------|------------------|
| PHYS1  | 2                  | 66               |
| PHYS20 | 1                  | 59               |
| PHYS40 | 2                  | 77               |
| PHYS42 | 2                  | 84               |

The average class size for Fall of 2011 has to be corrected from the reported value of 18 to 43! The same level of correction applies to all the Fall and Spring semesters. We are in process of recalculation all these numbers for the past semesters.

For the same semester, the average lab enrollment for the stand-alone PHYS21L course was 28. The maximum capacity for each Physics lab is 24.

Lecture classes in physics have appropriate enrollment limits of about 30 to 40. Physics lab classes have appropriate limits of 24. We have been allowing students over the class limit for all the Physics lectures and labs.

ALL Locations Average Class Size (**data are flawed. See bold faced explanation above**).

|      |       |       |       |       |       |       |       |       |       |       |       |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| DISC | X2010 | F2010 | S2011 | X2011 | F2011 | S2012 | X2012 | F2012 | S2013 | X2013 | F2013 |
| PHYS | 28.0  | 18.4  | 23.0  | 33.0  | 18.0  | 19.7  | 0.0   | 15.7  | 19.1  | 17.3  | 15.5  |

### 5.3 Instructional Productivity

The instructional productivity of the Chemistry Department has averaged well above the college-wide goal for the past five years. This higher-than-average productivity (19.2 over the last five years) should be maintained, although perhaps not at quite as high a level as has been observed. This level of productivity is maintained by careful and thoughtful scheduling.

| <b>Instructional Productivity</b> | <b>Chemistry</b> |
|-----------------------------------|------------------|
| F13                               | 19.76            |
| S13                               | 19.37            |
| F12                               | 19.52            |

### PHYSICS

The physics offerings have packed enrollments. Our FTES/FTEF ratios are maxed out. We only offer single sections of most of our classes so we have no flexibility in combining sections. Lab enrollments are limited by facilities and equipment.

#### ALL Locations FTES/FTEF Efficiency

|       |       |       |       |       |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| PHYS  | X2010 | F2010 | S2011 | X2011 | F2011 | S2012 | X2012 | F2012 | S2013 | X2013 | F2013 |
| FTES  | 2.98  | 50.71 | 72.99 | 3.69  | 54.81 | 69.82 | 0.00  | 51.41 | 63.81 | 9.01  | 66.86 |
| FTEF  | 0.21  | 2.60  | 3.41  | 0.21  | 2.73  | 3.80  | 0.00  | 2.93  | 3.55  | 0.87  | 4.00  |
| Ratio | 14.49 | 19.50 | 21.39 | 17.92 | 20.05 | 18.37 | 0.00  | 17.53 | 17.98 | 10.31 | 16.72 |

## 5.4 Curriculum Currency

### Is the curriculum current?

Yes. All of the Chemistry and Physics course outlines are current and have SLOs.

### How does the program encourage students to complete certificates, licenses, or majors?

The Department of Chemistry and Physics provides prerequisite courses for numerous Associate degrees.

The Chemistry major has been approved since 2008 and the Physics major since 2009.

## 5.5 Successful Program Completion

The Chemistry program has set up a rotation plan designed to help students complete our program in a timely manner. For a chemistry major, life science, or pre-med student, there is a five-semester sequence that needs to be completed: Chem 42-Chem 1A or 4A-Chem 1B or 4B-Chem 12A-Chem 12B. Students who pass the placement test can skip Chem 42 and complete the program in 4 semesters, but the majority of our students begin the sequence at Chem 42. For this reason, we have scheduled our summer session to accommodate the extra semester. We offer Chem 42, Chem 1A, and Chem 1B in the summer so that a student can still complete Chem 12B at the end of the fourth (non-summer) term. We also offer an

evening sequence for Chem 42-Chem1A-Chem 1B for those students who work during the day. We also offer Chem 60 in the evening 3 out of every 4 semesters.

The Chemistry program has awarded a total of 14 associates degrees since the degree was approved in 2008 - 4 in 2009-2010, 2 in 2010-2011, and 8 in 2012-2013. These figures are not entirely surprising, since our department's main function is to serve students in a wide variety of STEM and health related majors. Approximately 50 students complete Chem 12B each Spring, and this number better represents the number of students that complete our program. Also, the number of students who complete Chem 1A or Chem 1B as their final chemistry course requirement for engineering, physics, or other science majors have technically completed the short version of our program. We would like to increase the number of students who major in Chemistry, and in Fall 2014, we have started a small PR campaign to attract more students to the Chemistry major.

## PHYSICS

The Physics program's core mission is to prepare students for transfer in physics as well as all the disciplines within engineering and science

The program also offers an AS major in Physics.

## 5.6 Student Success

It appears that, within statistical boundaries, the retention and course completion data for the chemistry department closely matches the district averages. The average GPA of our students tends to be slightly lower, but the number of rigorous science and math courses that our students generally have to take tend to have that effect on their collective GPA.

Retention:

| <b>Retention</b> | <b>Chemistry</b> |
|------------------|------------------|
| F13              | 79.1%            |
| S13              | 79.2%            |
| F12              | 77.5%            |

Course Completion/Success:

| <b>Course Completion</b> | <b>Chemistry</b> |
|--------------------------|------------------|
|--------------------------|------------------|

|     |       |
|-----|-------|
| F13 | 73.9% |
| S13 | 71.6% |
| F12 | 71.4% |

GPA:

| <b>Grade Point Average</b> | <b>Chemistry</b> |
|----------------------------|------------------|
| F13                        | 2.57             |
| S13                        | 2.52             |
| F12                        | 2.45             |

#### PHYSICS

Students retention (Rten), course completion (Comp) and grade point average (GPA) are tabulated below:

|       |       |       |       |       |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Sem   | X2010 | F2010 | S2011 | X2011 | F2011 | S2012 | X2012 | F2012 | S2013 | X2013 | F2013 |
| Reten | 89.3% | 82.2% | 87.8% | 84.4% | 81.0% | 89.2% | 0.0%  | 87.1% | 87.2% | 93.9% | 86.8% |
| Comp  | 85.7% | 78.0% | 85.7% | 81.3% | 79.5% | 86.1% | 0.0%  | 83.9% | 84.6% | 92.4% | 85.4% |
| GPA   | 3.04  | 2.81  | 3.00  | 3.41  | 2.90  | 2.99  | 0.00  | 2.87  | 3.08  | 3.41  | 3.06  |

Retention and course completion statistics in Physics classes over the 4 years of data fluctuate above 80% without any significant trend. This level of retention is quite high for the challenging subjects in our department, significantly higher than at other institutions. We feel this is accomplished primarily by the excellent quality of students we enjoy at SRJC because of our reputation and our scholarships, the excellent preparation our students receive in all their STEM preparatory classes, and the esprit de corps developed in our program both in classes and extra-curricular activities.

The percentage of successful course completion also remains steady fluctuation around 80%.

Grade point averages for the Physics classes have remained stable in the 2.8-3.0 range.

## 5.7 Student Access

The Chemistry Department continues to maintain a diverse student population in keeping with the District percentages through its relationship with MESA and participation in community outreach programs.

| <b>Ethnicity</b> | <b>Dept. 10/11</b> | <b>13/14</b> |
|------------------|--------------------|--------------|
| White            | 59.0               | 53.2         |
| Asian            | 5.8                | 6.0          |
| Black            | 2.3                | 1.9          |
| Hispanic         | 12.6               | 26.9         |
| Native American  | 1.5                | 0.7          |
| Pacific Islander | 0.6                | 0.1          |
| Filipino         | 1.1                | 1.6          |
| Other Non White  | 0.0                | 5.4          |
| Decline to State | 17.1               | 4.2          |

| <b>Gender</b> | <b>10/11</b> | <b>13/14</b> |
|---------------|--------------|--------------|
| Male          | 43.9%        | 43.3%        |
| Female        | 54.8%        | 54.0%        |
| Unknown       | 1.3%         | 2.8%         |

### PHYSICS

Data listed below indicates a steady increase in the percentage of Hispanic students in Physics and a slight increase in the age range of 21 to 25.

| Physics | Ethnicity        | 2010-11 | Percent | 2011-12 | Percent | 2012-13 | Percent | 2013-14 | Percent |
|---------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|
|         | White            | 428     | 58.4%   | 426     | 58.1%   | 405     | 61.5%   | 532     | 57.3%   |
|         | Asian            | 66      | 9.0%    | 43      | 5.9%    | 57      | 8.6%    | 86      | 9.3%    |
|         | Black            | 7       | 1.0%    | 11      | 1.5%    | 10      | 1.5%    | 14      | 1.5%    |
|         | Hispanic         | 92      | 12.6%   | 121     | 16.5%   | 97      | 14.7%   | 199     | 21.4%   |
|         | Native American  | 3       | 0.4%    | 8       | 1.1%    | 2       | 0.3%    | 3       | 0.3%    |
|         | Pacific Islander | 1       | 0.1%    | 2       | 0.3%    | 0       | 0.0%    | 0       | 0.0%    |
|         | Filipino         | 5       | 0.7%    | 10      | 1.4%    | 13      | 2.0%    | 13      | 1.4%    |
|         | Other Non-White  | 0       | 0.0%    | 0       | 0.0%    | 0       | 0.0%    | 53      | 5.7%    |

|                  |     |        |     |        |     |        |     |        |
|------------------|-----|--------|-----|--------|-----|--------|-----|--------|
| Decline to state | 131 | 17.9%  | 112 | 15.3%  | 75  | 11.4%  | 28  | 3.0%   |
| ALL Ethnicities  | 733 | 100.0% | 733 | 100.0% | 659 | 100.0% | 928 | 100.0% |

| Physics | Age Range  | 2010- | %      | 2011-12 | %      | 2012-13 | %      | 2013-14 | %      |
|---------|------------|-------|--------|---------|--------|---------|--------|---------|--------|
|         | 0 thru 18  | 61    | 8.3%   | 56      | 7.6%   | 41      | 6.2%   | 77      | 8.3%   |
|         | 19 and 20  | 280   | 38.2%  | 296     | 40.4%  | 256     | 38.9%  | 296     | 31.9%  |
|         | 21 thru 25 | 254   | 34.7%  | 268     | 36.6%  | 248     | 37.7%  | 385     | 41.5%  |
|         | 26 thru 30 | 78    | 10.6%  | 60      | 8.2%   | 60      | 9.1%   | 101     | 10.9%  |
|         | 31 thru 35 | 25    | 3.4%   | 29      | 4.0%   | 34      | 5.2%   | 42      | 4.5%   |
|         | 36 thru 40 | 14    | 1.9%   | 12      | 1.6%   | 14      | 2.1%   | 12      | 1.3%   |
|         | 41 thru 45 | 10    | 1.4%   | 7       | 1.0%   | 0       | 0.0%   | 11      | 1.2%   |
|         | 46 thru 50 | 3     | 0.4%   | 3       | 0.4%   | 4       | 0.6%   | 2       | 0.2%   |
|         | 51 thru 60 | 8     | 1.1%   | 2       | 0.3%   | 1       | 0.2%   | 1       | 0.1%   |
|         | 61 plus    | 0     | 0.0%   | 0       | 0.0%   | 1       | 0.2%   | 1       | 0.1%   |
|         | ALL Ages   | 733   | 100.0% | 658     | 100.0% | 927     | 100.0% | 733     | 100.0% |

## 5.8 Curriculum Offered Within Reasonable Time Frame

Our general chemistry sequence (1A - 1B) is offered in Fall-Spring, Spring-Fall, Summer-Fall and Spring-Summer patterns. The organic chemistry sequence is offered each year in a Fall-Spring pattern. Chem 60 and Chem 42 are offered every semester.

The Physics program currently offers all courses each semester and several courses during summer session.

## 5.9a Curriculum Responsiveness

Chemistry has one General Ed. course, Chemistry 42. It is a one semester general chemistry course with a laboratory. It is taught in compliance with the CSU/UC requirements. It is also a pre-requisite for those students who are not prepared for Chem 1A, and therefore serves science and engineering programs and majors. Physics offers a conceptual physics course for general education.

Chemistry and Physics serve mostly as support programs for almost all STEM majors. We serve over 700 students each semester. The majority of our students transfer as STEM majors to four-year universities, and the remainder go on to certificates and degree programs in the allied health fields.

### 5.9b Alignment with High Schools (Tech-Prep ONLY)

not applicable.

### 5.10 Alignment with Transfer Institutions (Transfer Majors ONLY)

The Chemistry and Physics majors at SRJC match the lower-division requirements at Sonoma State University, UC Davis and UC Berkeley (the three most common transfer institutions for chemistry majors), as well as virtually all other CSU and UC campuses .

### 5.11a Labor Market Demand (Occupational Programs ONLY)

PHYSICS  
N/A

### 5.11b Academic Standards

The department monitors and discusses academic standards on a regular basis, through the evaluation process and curriculum updates. Student Learning Outcome assessments are performed on a regular basis, and the results are used to maintain our high academic standards.

## 6.1 Progress and Accomplishments Since Last Program/Unit Review

| Rank | Location | SP | M  | Goal                                                | Objective                | Time Frame | Progress to Date                                                                                   |
|------|----------|----|----|-----------------------------------------------------|--------------------------|------------|----------------------------------------------------------------------------------------------------|
| 0001 | ALL      | 01 | 01 | Restore our regular faculty positions               |                          | 2014-2016  | We have hired two additional full time faculty, one Chemistry and one Physics, to begin Fall 2015. |
| 0002 | ALL      | 01 | 01 | Extend interdepartmental cooperation and efficiency | Explore possible mergers | complete   | the Chemistry and Physics programs have merged into a single department.                           |

## 6.2a Program/Unit Conclusions

| Location | Program/Unit Conclusions |
|----------|--------------------------|
| Other    |                          |

## 6.2b PRPP Editor Feedback - Optional

### 6.3a Annual Unit Plan

| Rank | Location | SP | M  | Goal                                                     | Objective                                                                                                                                     | Time Frame | Resources Required                                                      |
|------|----------|----|----|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------|
| 0001 | ALL      | 01 | 01 | Ensure proper levels of faculty and classified staffing. | Hire an additional physics faculty member and additional classified staff and eliminate STNC positions in the Chemistry and Physics programs. | 2015-2016  |                                                                         |
| 0002 | Petaluma | 01 | 01 | Expand Chemistry and Physics programs in Petaluma        | Offer Chem 42 and Physics 1 and 11 in Petaluma. Eventually expand to other courses.                                                           | 2015-2017  | Financial support for lab equipment and additional classified staffing. |