As part of the West Virginia University Board of Governor's Rule 2.2 Program Review process, the WVU Provost's Office required that a single Program Review Self-Study Form be completed on behalf of all identified programs in the department or unit. This Program Review Self-Study Form was to be submitted to the Provost's Office by end of day on August 1, 2023. The Provost's Office reviewed the submitted Program Review Self-Study Forms in early August.

Self-Study content is unvetted by the Provost's Office. As such, the WVU Provost's Office cannot attest to the accuracy of any data, analyses, or statements provided within. Also, redactions were made where warranted for the protection of individual identities around sensitive information.

BOG Program Review

Start of Block: Overview

Q1.1
BOG Program Review Self-Study Form

This is the self-study form that will be completed in support of the summer 2023 academic transformation program portfolio review.

Only one program review self-study is to be submitted per unit; all of the unit's *programs* will be covered by one self-study.

Q1.2 Select the appropriate academic unit under review.
College
Department or School

▼ Eberly College of Arts and Sciences
- C. Eugene Bennett Department of Chemistry

Q1.3 List all of the unit's programs.

BA Chemistry
BS Chemistry
MS Chemistry
PhD Chemistry

Q1.4 Name and Email of the person completing the self-study

○ Name ___Gregory B Dudley_____

○ Email Address ___gregory.dudley@mail.wvu.edu _____

Q1.5 How were faculty given the opportunity to contribute to, review and provide feedback on this self-study?

All faculty within the C. Eugene Bennett Department of Chemistry were informed on Monday July 10, 2023 (soon after the chair received the news) and by email from the chair that the BA/BS Chemistry degree programs had been identified for formal review. Faculty were kept informed of the process for writing the program review self-study. A draft self-study was completed on July 24, with comments received and included before and after completion of the first draft. A second draft was sent around for faculty comment and feedback on July 27. A Zoom faculty meeting was held on Friday July 28 at noon to discuss comments and feedback received and to finalize the self-study. A final draft was shared on July 31 prior to its submission on Aug 1, 2023.

In addition, an executive summary outline and overview was provided to the faculty, as follows:

1. Faculty FTE
    a. permanent faculty have increased since 2020, but part-time faculty decreased, with overall faculty teaching resources remaining roughly constant since 2020
    b. our faculty has decreased since 2017 (22 TTF, 8 TAP, plus part-time instructors)
        i. our service course offerings and PhD production have grown despite faculty attrition, but our majors-specific course offerings have decreased
    c. **Plan to reduce costs**: savings will be realized short-term through two faculty departures planned for 2024
    d. **Plan to increase instructional efficiency**: efficiency can be improved long-term through curriculum overhauls that will improve our faculty-to-majors ratio
    e. **Evidence of progress:** 10-year faculty hiring plan from 2018 aimed at establishing national prominence in Catalysis and Bioanalytical Chemistry has been re-envisioned to prioritize Chemical Education and Computational Chemistry, which require less startup and renovations costs.
2. Enrollment/SCH
    a. our overall SCH production is driven by service courses
    b. enrollment in service courses has declined, while service course offerings have increased, highlighting opportunities for realizing savings and efficiencies
    c. enrollment in our specific majors has been declining coincident with increases in Biochemistry, Neuroscience, Forensic Chemistry, and other interdisciplinary programs whose majors we serve, highlighting opportunities for better marketing and recruiting
    d. enrollment in our PhD program is high and has been growing, although we had to slash admissions this fall due to budget cuts
    e. outdated and dilapidated facilities are a liability for recruiting and retention
    f. **Plan to increase instructional efficiency**:
        i. efficiency can be improved short-term by consolidation of service course offerings and long-term through curriculum overhaul
        ii. efficiencies and growth can be realized long-term by incorporating Biochemistry majors and some pre-pharmacy students into Chemistry, perhaps with better recruiting, retention, and rebranding (eg Bennett Department of Chemistry and Molecular Biochemistry, BCMB, which may be a unique designation nationally)
    g. **Evidence of progress:** active recruiting into the undergraduate major is underway
3. Expenses
    a. major 2020-2022 expenses include lab renovations, startup funds, and teaching lab supplies, which have fluctuated greatly year-to-year

b. the 3-year average showing net decline in expenses and net positive cash flow is probably representative of actual longer term trends
c. **Plan to reduce costs**: savings can be realized by deferring hiring and renovations and expanding the use of online teaching labs where possible
d. **Evidence of progress:**
    i. As noted above, projected startup and lab renovations costs associated with faculty hiring plans have been reduced.
    ii. Online teaching labs for non-majors are being reexamined this summer for trial launch as soon as Spring 2024, saving lab supply costs in FY24.

Additional plans to reduce costs and/or increase instructional and operational efficiency. The following revenue-neutral or cost-saving proposals and visions were outlined:

1. Work with Foundational STEM Collaborative to improve student success, recruiting, and retention
2. Incorporate the Intercollegiate Biochemistry major formally into Chemistry and eliminate redundancies (much of Biochemistry advising and accreditation already handled through Chemistry)
3. Create Pharmaceutical Chemistry BS major using current resources
4. Create non-ACS options for Chemistry BS major using current resources
5. Offer more online labs for substantial recurring cost savings
6. Align ACS Chemistry and ACS Biochemistry BS majors with new 2023 ACS Guidelines using current resources and projecting longer term recurring cost savings

	2022-2023	2023-2024	2024-2025	Anticipated 2024-2025 Cost Savings	Anticipated 2024-2025 Revenue Increase	Anticipated Budget Impact
Supp ementa nstruct on sav ngs	–	$40,000 (on ne 111L & 112L; conso date 115L n C ark)	$80,000 (on ne 115L)	$120,000		$120,000
Increase SCH w th h gher course capac ty, curr cu um changes, eff c ent schedu ng (Cred t hours x tu t on)	–	$0	$278,053 (3-cred t CHEM 110)		$278,053	$278,053
Personne expenses (.e. future ret rement, conso dat on of adm n strat ve ro es)	–	$362,029 (5 facu ty/staff)	TBD	TBD		$362,029
GTA reduct on		$153,090	TBD	TBD		$153,090
Net budget impact						**$635,398**

End of Block: Overview

Start of Block: Mission

*

Q2.1 Explain how the unit and its programs contributes to WVU's mission.

This response is limited to 7500 characters, approximately 2 single spaced pages.

Chemistry is central to enhancing the Science, Technology, Engineering, and Mathematics (STEM) talent pipeline and promoting research and innovation in and beyond West Virginia. West Virginia needs more students who are interested in STEM fields, chemistry in particular. Moreover, most students who major in STEM and health-related disciplines in college are required to take some form of chemistry coursework during their first two years. For example, students who major in biology, biochemistry, immunology and medical microbiology, exercise physiology, chemical engineering, and neuroscience must take a minimum of two years of chemistry, beginning in general chemistry and finishing with organic chemistry (four semesters). Other majors, such as general engineering, nursing, animal and nutritional sciences, plant science, and geology must take 1-2 semesters of first-year chemistry.

Chemistry degrees are consistently perceived as among the most valuable in terms of short-term and long-term employment success. For BA/BS Chemistry majors, jobs exist for them in West Virginia at companies (e.g., MATRIC, SI Group, Solvay, and Chemours), national laboratories (e.g., NETL, NIOSH), and in healthcare. Likewise, the BA and BS Chemistry degree programs provide students with opportunities for advanced post-undergraduate training in professional degree programs (e.g., pharmacy, dentistry, medicine, law) and graduate school (MS or PhD) in chemistry or related fields. The chemistry undergraduate degree programs provide students with prosperity by providing access and opportunity (i) to a certified degree and (ii) to opportunities to enhance in-class learning through engagement in undergraduate research, peer tutoring, and/or assisting in teaching laboratories.

An understanding of chemistry is important for the state – its public officials and citizens – to inform upcoming decisions on resource allocation related to the state's economy and its environment. For instance, the state has important decisions to make related to the future of coal production and its chemical effects on the environment. Support in the form of funding and scientific advances are important for cleaning up West Virginia's land and water to promote the health and well-being of its citizens and to support the state's burgeoning tourism economy. Likewise, West Virginia industries in the areas of pharmaceuticals, additives, food and nutrition, safety, and health products rely on a scientifically literate citizenry for employees. Knowledge and appreciation of chemistry by West Virginians of all ages (K-12+) is crucial for the future of our state.

The Chemistry undergraduate degree programs are critical to WVU's land-grant mission of creating a diverse and inclusive culture that advances education, healthcare and prosperity for all. Of the 44 WV colleges and universities listed under the Carnegie Classification of Institutions of Higher Education, WVU is the only institution that offers all three levels of ACS-approved chemistry degrees, the BS, MS, and PhD degrees. Further, WVU is one of only four institutions in WV that offers the ACS-approved BS in Chemistry (the others are Fairmont State, Marshall, and WV State). In addition, the C. Eugene Bennett Department of Chemistry is the

only campus in the WVU system that offers graduate degrees in chemistry. Nationwide, WVU is one of only 701 institutions that offers ACS-certified chemistry programs. WVU is one of only 63 institutions nationwide that has held its ACS degree certification for 83 years (certified since 1940) and WVU shares this distinction with prestigious schools such as CalTech, Case Western Reserve, Columbia, Cornell, Duke, Johns Hopkins, MIT, Princeton, Purdue, and UCLA. Retaining the undergraduate Chemistry degree programs and continuing to develop and support lecture and laboratory teaching innovations and enhanced infrastructure, especially in first- and second-year chemistry courses, will improve persistence of students in their STEM major and will result in more graduates ready for employment by West Virginia's STEM and healthcare industries.

In addition to the undergraduate majors, our unit makes out-sized contributions to the research mission and the Carnegie R1 designation through our PhD program, and to STEM teaching across the university through our service courses for non-majors. The vast majority of our course offerings support students other than (just) chemistry majors.

End of Block: Mission

Start of Block: Resources, Revenue, and Expenses

Q3.1
Resources, Revenue, and Expenses

The purpose of this section is to ensure the accessibility and adequacy of the unit's infrastructure and resources and its financial viability.

Responses in this section are limited to 7500 characters or approximately 2 single spaced pages.

Q3.2 Has the unit experienced significant issues with any of the following during the past five years?

By "significant," we mean issues that interfere with either the unit's ability to deliver its programs to its students or the students' ability to complete those programs in a timely manner.

	Yes	No
Ability to schedule required classrooms	○	○ X
Access to adequate technological infrastructure	○	○ X
Access to adequate technological support	○	○ X
Access to adequate physical infrastructure (labs, performance spaces, etc.)	○ X	○

Display This Question:

If Has the unit experienced significant issues with any of the following during the past five years?... = Yes

Q3.3 Describe the issues the program has faced in the area(s) identified above.

The Chemistry Research Lab (CRL) and Clark Hall buildings are on Prospect Street, WVU Downtown Campus. CRL houses (i) faculty research labs wherein graduate and undergraduate students carry out research and (ii) tenure/tenure-track and teaching faculty offices. CRL is decrepit with a leaking roof and windows, rusty water lines, and double-paned windows with broken seals. Faculty continually battle water leaks in their research labs and offices, covering expensive instrumentation with large sheets of plastic for protection and placing towels along windows to absorb the rainwater. CRL critically lacks a freight elevator, so chemicals and other hazardous materials must be transported on the passenger elevator. Further, the CRL building strength and engineering are insufficient to support the weight of some modern equipment. An EPR (Electron Paramagnetic Resonance) instrument had to be placed in the basement of Clark Hall next door.

When touring prospective undergraduate students through CRL, it is awkward to discuss engaging in cutting-edge undergraduate research opportunities when the facilities are obviously antiquated and in need of upgrade and repair. Prospective undergraduate chemistry majors and their parents who visit the WVU campus are also visiting peer institutions. The side-by-side comparison between the CRL research facilities at WVU and those in chemistry departments at peer institutions is heavily weighted toward our peer institutions. Our deteriorating facilities can only hurt our ability to recruit undergraduate students to WVU and the chemistry major. There is

also a general lack of modern amenities in CRL (e.g., only one restroom per research floor, few shared spaces, no freight elevator, etc.) which impacts recruiting, retention, and productivity.

Clark Hall houses (i) lecture rooms and (ii) teaching laboratories. Recent renovations supported by the Bennett Foundation on the 1st and 2nd floors provided cosmetic upgrades to the first-year general chemistry teaching labs (CHEM 111L-116L). There have been repeated water leaks in 400 Clark, which have damaged expensive laboratory teaching instrumentation. In 2015, we had a catastrophic instrumentation loss due to water leaks. Recurring leaks in the same area damaged some of the replacement equipment, with a recent insurance settlement. More recently (June 2023), water leaked through the ceiling tiles of 417 Clark Hall, a lab room that is used for both undergraduate teaching and research and that offers instrumentation for both teaching and research. Expensive instrumentation was removed from the room. On July 24, 2023 we experienced a massive water leak in 414 Clark Hall ruining the carpeting, most of the ceiling tiles, and the projection system and resulting in leakage of water into the room below (312 Clark Hall).The extent of the damages to these three rooms has yet to be determined.

Despite our facilities, our chemistry faculty are engaged in cutting-edge research and scholarship that is published at high rates in peer-reviewed journals, attracts funding from federal granting agencies ($2,388K research expenditures in 2022), and/or positively impacts our community, as discussed below in Q4.3.

Q3.4 Data have been provided on the unit's last three years of tuition revenue, expenses, and net revenue. Address any negative net revenue or any significant changes (positive or negative) to unit's net position.
Revenue by department is the actual tuition revenue, net of any discounting, paid by students taking courses in course subject codes affiliated with the department.
Expense by department is the actual unrestricted, operating expenditures by department within the functions of instruction and academic support.
Net revenue is the revenue minus the expense.

For the Chemistry Department, the Academic Portfolio Program Review Data table indicates that our department’s net revenue was negative (-$1,314,717) for FY2022 whereas in the two previous years it had been positive. It was overall positive for the reporting period. Our overall expenses have decreased slightly from 2020-2022 despite high inflation. Net tuition revenue has steadily decreased over the last three years because student credit hours in courses coded as CHEM were down by -4,840.

Chemistry courses continue to be required for STEM students across WVU. While enrollment in our BA/BS degree programs has declined during this time, the bulk of the -4,840 student credit hours comes from our service courses, which is also where we can make the most substantial and impactful corrections. Declining enrollment in our service courses is likely driven by declining university-wide enrollments and any decreases in the number of chemistry

courses required for each specific STEM major (e.g., majors that only require CHEM 231 as opposed to CHEM 233/234), which we must consider in our long-term curriculum planning.

Three ideas are offered for reducing costs this year and beyond: personnel attrition (ca. $350k savings in FY24, cf. Q4.4), expenditure reduction (ca. $100k savings in FY24, cf. Q6.2), and administrative consolidation (FY25 and beyond, cf. Q6.2), along with other revenue-positive growth opportunities covered in Q6.2, Q7.1, and elsewhere.

End of Block: Resources, Revenue, and Expenses

Start of Block: Faculty Composition and Productivity

Q4.1
Faculty Composition and Productivity

Responses should be concise but also specific and supported by evidence. Responses in this section are limited to 7500 characters or approximately 2 single spaced pages.

Specific data definitions for these metrics are available on the Academic Transformation webpage.

Q4.2 Data have been provided on the unit's faculty full-time equivalency (FTE) to the median of all majors for fall 18 to fall 22.

Address any differences in the unit's student to FTE ratio and the institution's student-to-faculty ratio of 18-to-1 per IPEDS reporting for academic year 2021-2022.

As indicated in the report, the unit’s FTE to majors ratio is 7-to-1, which is below the median. The size of our faculty reflects our PhD program and service teaching. Very few of our courses uniquely serve our majors. For example, in Fall 2023, we are only offering 4 lecture and lab sections specifically for BA/BS Chemistry majors (335L, 346, 346L, and 422L, plus 191 and capstone as required) as opposed to >150 lecture and lab sections that primarily serve other majors and/or also support our PhD program. Our faculty make outsized contributions to the Carnegie R1 rating through external research expenditures and PhD production, and our majors comprise only a small fraction of our teaching workload.

The chemistry department had 67 undergraduate BS and BA majors in Fall 2022, which we aspire to increase. Faculty workloads are weighted heavily to graduate research and/or service teaching. We teach significant portions of our undergraduate curriculum to thousands of non-chemistry STEM majors. Considering the strength of our PhD program, those students who

choose to major in chemistry enjoy opportunities for experiential learning through cutting edge research, resulting in excellent professional development. We aspire to reverse the declining enrollment trend for our major, and we offer ideas for doing so, but the size of our faculty reflects the strength of our PhD program and breadth of our service teaching responsibilities more so than the number of students in our majors.

Our FY2022 SCH production of 23,387 reflects the unit's delivery of significant chemistry coursework to non-majors. We only provide a limited number of courses uniquely to our majors, with the bulk of our offerings supporting students other than chemistry majors. Our faculty provide courses, mentoring, and research support to serve our graduate students (including $2.4M in external research expenditures), and we deliver 100- and 200-level lecture and laboratory courses to non-majors that are necessary for students in STEM (e.g., biology, forensics, engineering, animal and nutritional sciences, exercise physiology) and non-STEM majors (e.g., nursing, elementary education). Lecture and laboratory courses that serve the undergraduate major but that are also populated by large numbers of students from diverse majors within the WVU portfolio include: CHEM 110 (2 credits, 87% non-majors in last 4 years); CHEM 115/115L (4 credits, 88% non-majors); CHEM 116/116L (4 credits, 91% non-majors); CHEM 215/215L (5 credits, 58% non-majors); CHEM 233/233L (4 credits, 85% non-majors), and CHEM 234/234L (4 credits, 91% non-majors). In addition, several upper-level classes that serve our major are also required of other majors, like CHEM 341/341L (4 credits, 86% non-majors). We also offer three courses that serve non-STEM majors — CHEM 111/111L (4 credits, 87% non-majors), CHEM 112/112L (4 credits; 100% non-majors), and CHEM 231/231L (4 credits, 100% non-majors) — for students seeking degrees in nursing, elementary education, geology, animal and nutritional sciences, and geology.

Thus, the chemistry department provides courses for a large population of students outside the major. A rough calculation gives a clearer picture of the FTE teaching efforts of our faculty highlighting our service to non-majors. If the FY 2022 SCH is divided by the number of FY 2023 faculty members and divided again by an average of 3 credit hours of chemistry per student, a student-to-FTE faculty ratio of 278-to-1 is obtained (23,387 SCH/28 faculty x 1 student/3 chemistry credit hours = 278 students/faculty member). Of our 28 FY 2023 faculty members, 11 are teaching faculty who primarily teach service courses at the 100- and 200-levels to a large number of non-majors. Our teaching faculty have created structures for automatic grading of laboratory reports, homework assignments provided through WVU's learning management system (ecampus), and curricular reforms to courses with historically high DFW rates. These curricular reforms lower the cost of student enrollment (negate purchase of laboratory manuals and costly access to online homework system) and support student success and retention in their intended STEM major and/or at WVU.

Q4.3 This question is optional and required only if a unit's doctoral programs are under review.

Data have been provided on the unit's tenure-track / tenured FTE to doctoral student headcount ratio across all of the unit's doctoral programs.

Address any differences in the unit's doctoral student to tenure-track and tenured faculty FTE ratio to the institutional expectation of 2-to-1.

There is excellent synergy between our BS, MS, and PhD programs, both incidental and by design. Strength in one program elevates the others, and vice versa. For example, many of our graduate courses can be and/or have been cross-listed as upper-level courses for our majors, and the research infrastructure built around our graduate program provides experiential research opportunities for undergraduate students within and beyond the chemistry department.

Our tenure-track / tenured FTE to doctoral student headcount of better than 5-to-1 exceeds the institutional expectation and reflects our faculty strength in this area. Our chemistry faculty engage in cutting-edge research and scholarship that is published at high rates in peer-reviewed journals, attracts funding from federal granting agencies ($2.4M research expenditures in 2022), and/or positively impacts our community. In addition, three chemistry faculty members have received institutional awards for their Distinction in Mentoring Undergraduates in Research. Our faculty routinely provide undergraduate research opportunities for Chemistry majors. On average, approximately one-third of our undergraduate majors are engaged in research during any given academic semester. For example, there were 23 distinct Chemistry majors enrolled in undergraduate research coursework during the Spring 2023 semester with 14 different faculty members. Our teaching faculty have worked hard to lower DFW rates by modifying pedagogy, developing in-house free resources (online homework, laboratory manuals and experiments), implementing teaching pedagogy as informed by the educational research on how students learn best, and with input from their students. For example, we recently improved pedagogy in CHEM 110 aimed at improving student learning outcomes and reducing DFW rates (see also Q5.3). We track student success across multiple courses to ensure that gains in one course are not offset by losses in subsequent courses. For AY2022-23, DFW rates in CHEM 110 and CHEM 115 improved by 22.4% and 6.0%, respectively, relative to the three years preceding (Fall 2019-Spring 2022). Success in CHEM 110 has always been a good predictor of success in CHEM 115 and beyond. Now, for students who took CHEM 110 under the revised pedagogical model, our DFW rate taken across the two-semester sequence has declined by 16.6%. In other words, students are successfully completing CHEM 110 and 115 faster than before.

In addition to teaching and research, our faculty routinely give back to the state and provide science outreach aligned with WVU’s land-grant mission. Tobi Odeleye is the WVU faculty representative for West Virginia's Science Public Outreach Team (SPOT) and assists in recruiting and training WV undergraduates to bring presentations about current West Virginia science, technology, and engineering to West Virginia K-12 classrooms, museums, and youth programs. Since 2013, SPOT undergraduates have delivered 800 presentations and impacted the lives of more than 25,000 high school students - including encouraging them to attend college and major in STEM. Michelle Richards-Babb has been co-Institutional Representative for the WVU-First2 Institutional Team that hosts paid academic year programs for students including campus clubs, First2 Scholars and First2 Directors. Undergraduate STEM students

from demographics underrepresented in STEM (first-generation, low-income/Pell eligible, rural WV, African American, Hispanic, etc.) are supported in research, in implementing change initiatives, and in providing student voice to faculty and administrators. In 2023, a minimum of 21 undergraduate STEM majors will be financially supported through this initiative. The Bennett Careers for Chemists is an annual, high profile, and self-supported event that draws students from local high schools and highlights the impacts of chemistry in society and professional development. Additional examples include: (i) presentation of the December 2022 Children's Chemistry Show, an annual show that features chemistry demonstrations and hands-on activities for members of the public (young and old alike) with 150+ attendees; (ii) earning of the Chemistry Merit Badge by 15 middle school students during the Feb 2023 Merit Badge U; (iii) earning of the Chemistry Merit Badge by 11 Girl Scouts in April 2023; and (iv) providing of hands-on science activities (chemistry of big bubbles, elephant toothpaste, household acids/bases and oobleck) to rural, low-income K-9 children attending the Summer of Fun at the Shack Neighborhood House in Morgantown, WV.

Q4.4 Data have been provided that show the changes to the unit's total number of faculty over the review period. Data have also been provided that show the total student headcount enrolled in all of the unit's programs over the same period of time as well as a three-year trend in student credit hour (SCH) production.

Explain the relationship between the change in the number of faculty in the unit and the change in the units total headcount enrollment and SCH production trends.

The unit total number of faculty data in the report distort longer term trends. The report indicates an FTE change of +6 over the reporting period (2020-2023), but a broader lens reveals that our faculty is actually shrinking: from FY2017-2024, our FTE change will be -4. The report data also fail to capture visiting and part-time faculty (e.g., Trina Perrone, Mary Railing, Kacee Caster, etc.) that we had been hiring on a recurring basis (but aren't anymore) to maintain coverage of our teaching responsibilities.

In FY2017, we had 22 tenured / tenure-track faculty and 8 teaching faculty for a total of 30 faculty. By the end of FY2024, and assuming no additional faculty losses, we will be down to 15 tenured / tenure-track faculty and 11 teaching faculty, for a total of 26 faculty. Our current faculty number also includes two faculty (Legleiter and Kitchens) for whom we serve as the home unit but whose administrative and teaching responsibilities are in the Intercollegiate Biochemistry program.

The requested narrative explanation here takes these additional data and longer term trends into account when addressing the relationship between our faculty numbers and our overall SCH production trends.

Overall, our faculty ranks have decreased and shifted to support our teaching mission and the high demands for our service courses. Service course offerings have increased even as

enrollment has declined. As noted above, the reported faculty numbers do not include visiting faculty and per-course instructors who were covering the equivalent of at least two teaching faculty in 2020-2022. Of the 3 permanent teaching faculty who have been added since 2020, two may be considered permanent replacements for the cumulative work of recurring temporary faculty and not an actual increase in our faculty teaching capacity. The third was an addition through the Intercollegiate Biochemistry program, which we suggest (cf. Q7.1) could be formally rolled into the Chemistry department to achieve larger efficiencies, better representation of our contributions to undergraduate teaching, and renewed growth within our program.

Four (4) of the current 27 (was 28, but Jessica Hoover resigned since the reporting period) Chemistry faculty have reduced teaching assignments in Chemistry connected to FTE reduction, administration, advising, and/or shared duties across other units. Björn Söderberg is on 0.72 FTE in Fall 2023 and then will retire in December. Justin Legleiter directs the Intercollegiate Biochemistry program. Mark Schraf serves as our Academic Affairs Coordinator, taking over the duties of what used to be a full-time staff position. And as noted in the previous paragraph, Carolyn Kitchens is a teaching faculty member for the biochemistry intercollegiate program, with teaching responsibilities serving Biochemistry majors but with Chemistry serving as her home department.

Over the last few years, our faculty and SCH production have decreased, but our course offerings have increased, especially 100- and 200-level lecture and laboratory sections serving non-majors. The increase is significant. For example, in Fall 2020, we offered a total of 17 lecture sections of CHEM 110-116. In Fall 2023, we are offering 24 lecture sections of CHEM 110-116. The additional sections feature lower enrollments to benefit students, but they consume additional faculty workload to teach. There is a need to balance class size and number of section offerings with the number of available instructors. Considering the declining overall enrollment and SCH production, a reduction in STEM service course offerings would seem appropriate. Some reduction in offerings will be necessary to manage future faculty attrition and create workload opportunities to improve recruiting and retention in the chemistry major, which has likely suffered as a result of recent faculty attrition and increased offerings for non-majors. One would have to monitor student success data carefully, including both DFW rates in individual sections and student performance in subsequent courses.

Although our permanent faculty number has recovered somewhat in recent years, our total faculty teaching resources have stayed relatively flat and are now decreasing into FY24. Reducing our course section offerings would allow us to manage the reduction of two tenured faculty (Hoover and Söderberg) and three permanent staff in FY2024 compared to FY2023 (Alain Lui, Debra Hardesty, and Novruz Akhmedov) with a parallel decrease in salary expenditures. This attrition is already in progress: We lost one research-active, tenured faculty member who was recruited to a larger research institution (Hoover), with the move completed over summer 2023, and a second research-active, tenured faculty member will retire in December 2023 (Söderberg). An Administrative Secretary Senior left our department for a job elsewhere and will not be replaced (Hardesty), with some of the associated duties being absorbed by other staff. Our long-term NMR Specialist (Akhmedov) who supported and

operated the NMR Facility was eliminated through the Reduction in Force, with some of those associated duties being absorbed by faculty and staff already on the payroll. Finally, a lab staff member (Lui, Academic Lab Manager II) retired in June 2023 and has not yet been replaced, which is the latest in a series of reductions in our lab staff, student workers, and GTA support. We propose (cf. Q6.2) that we do not rehire to rebuild our lab staff, and instead improve the efficiency of our teaching lab offerings, including by streamlining duplications and moving teaching labs online where deemed pedagogically appropriate.

These five faculty and staff reductions (four locked in and one proposed) are expected to reduce our total salary expenses for FY2024 by $362,029.

Q4.5 Data have been provided that shows the unit's research expenditures per the Higher Education Research and Development Survey (HERD).

Does this data capture all of the unit's research expenditures? If not, explain the difference here and provide evidence of additional research expenditures below.

The external research expenditure of $2.4M seems reasonable given our grant portfolio; it ranks second in the College behind Physics and Astronomy. Our PhD program is not under review as a result of this number being over $1M. Our research expenditures also support our undergraduate major, as our research infrastructure supports our major and many of our majors engage directly in undergraduate research.

The ideal size of our graduate program comprises the sum of GA (GTA plus GRA) support resources available. Our PhD program has grown even as our faculty has shrunk due to increased external support for our research endeavors, especially on a faculty per capita basis. The confluence of PhD growth and faculty attrition brings us to our current tenure-track / tenured FTE to doctoral student headcount of 5.6-to-1. Meanwhile, our external Federal grant awards have increased from ca. 10 in FY2017 (for 22 TTF) to ca. 17 in FY2023 (for 17 TTF). This doubling of Federal external grants per PI drives the growth of our PhD program and reflects the strength of our graduate program and the return on investment it provides. On the other hand, our GTA allocation has been relatively flat since 2017, with a large reduction in FY24 that prompted us to slash admissions into our PhD program for the coming academic year. Coupled with faculty workload shifting to support our teaching mission, the current budget cuts may reduce our research expenditures and PhD production in future years.

Q4.6 Upload evidence of research expenditures here.

End of Block: Faculty Composition and Productivity

Start of Block: Student Enrollment

Q5.1
Student Enrollment and Graduation History

Responses in this section are limited to 7500 characters (approximately 1.5 single spaced pages). Responses should be concise but also specific and supported by evidence.

Specific data definitions for these metrics are available on the Academic Transformation webpage.

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Q5.2 Data have been provided on all of the unit's program's student enrollment trends.

That data includes:

4-year median fall enrollment (fall 18 through fall 21);
Fall 2022 change from 4-year median (in headcount and in percentage).

Units should address any programs with enrollment below the median for the program level or which has experienced a negative change in enrollment.

Enrollment in the BA/BS Chemistry major has decreased, and we aim to reverse this trend. The median enrollment from Fall 2018-2021 was 102.5 while the enrollment in Fall 2022 was 67 (-35% decrease). This decline coincides with increases in Biochemistry majors and other interdisciplinary majors whose students take many of our courses, as discussed under Q7.1. This decline also coincides with a national decrease in the number of students majoring in chemistry. Data from the American Chemical Society indicates that 12.1% fewer students graduated with a major in chemistry in 2021-22 than in 2020-21. Overlaid with general enrollment decline across WVU, these factors suggest that it is time to re-envision and rebrand our major (cf. Q7.1).

On observing these local and national trends, our department allocated additional time and energy to undergraduate recruitment starting in Fall 2021. Prior to that, we focused on PhD recruiting and relied heavily on WVU's centralized recruitment efforts for the undergraduate chemistry major. Beginning in Fall 2021, we began departmental efforts toward recruiting to the major with a ramping up of these efforts in 2022-23. We conducted 30+ one-on-one tours of the chemistry department, sent 40+ personalized, hand-written recruitment cards, and sent follow-up informational emails (with links to the major, careers in chemistry, and undergraduate research) to prospective students and their parents. Incoming freshmen interested in research opportunities are encouraged to meet one-on-one with Michelle Richards-Babb (Past Director of the WVU Office of Undergraduate Research) to discuss research opportunities and best practices for finding a faculty research mentor in the Chemistry Department. We sent

representatives to WVU recruitment events (e.g., Discover, Decide, Academic Day), often accompanied by current chemistry majors to assist. In addition, we recruit at invited hands-on science events such as at Careers in our Corridor (Nov 2022, Marion County National Guard) and by attending and interacting with teachers at the annual West Virginia Science Teachers Association (WVSTA) conference. During Summer 2023, Mark Schraf (Chemistry's Academic Advisor) had 30+ Zoom meetings with 25 distinct students, most intent on majoring in chemistry, during New Student Orientation.

Our focus on recruitment shows signs of paying off. For Fall 2023, we have 18 students enrolled in the CHEM 191 course for Chemistry majors, which is a 20% increase from Fall 2022. Preliminary numbers indicate that we will have 72 chemistry undergraduate majors (54 returning plus 18 incoming) in Fall 2023, a 7% increase from Fall 2022 (67). We expect to continue this upward trend as we aggressively recruit to the chemistry major through personalized marketing of the major. Currently, our recruitment efforts include departmental tours with chemistry faculty members, targeted emails detailing the major's benefits (e.g., job prospects, success in entry to graduate and professional schools, opportunities for undergraduate research), handouts documenting the current job positions and employers of WVU chemistry graduates, hand-written mailed notes to incoming first-year students, and faculty attendance and tabling at recruitment events. Our departmental tours have been very successful with the WVU Visitor's Center Team indicating in a handwritten thank you that "*Every family who went to a chemistry appt. wrote rave reviews and just wanted to hang out with you the rest of their time in Morgantown!*"

We plan to increase our connections with in-service chemistry teachers throughout the state. Anecdotal discussions with current students indicate that high school chemistry teachers have an outsized influence on their students' decisions to major in chemistry. Promoting interest in chemistry in K-12 and assisting and interacting with in-service teachers throughout the state will increase the number of students who enter college excited to take chemistry courses. We will continue attending the WV Science Teachers Association (WVSTA) fall conference to connect in-person with WV science and chemistry teachers and to promote the chemistry major and WVU. In addition, we will fashion a Qualtrics survey to request feedback from in-service middle and high school teachers who teach chemistry or chemistry concepts. We will gather teacher names and emails as well as suggestions on how the C. Eugene Bennett Department of Chemistry can assist in-service teachers. For instance, we will offer Zoom meetings with student groups to discuss the chemistry major and tips on succeeding in college and chemistry courses. Our ACS Student Affiliate group, with oversight from faculty, will offer a traveling chemistry demonstration show upon request.

Our recruitment plans also include submission of a proposal to the National Science Foundation (NSF) to fund scholarships for students with financial need who choose to major in chemistry. The NSF Scholarships in Science, Technology, Engineering, and Mathematics Program (S-STEM) "supports institutions of higher education to fund scholarships for academically talented low-income students and to study and implement a program of activities that support their recruitment, retention and graduation in STEM." The WVU Department of Physics and Astronomy was recently awarded an NSF S-STEM grant which served to increase

their number of undergraduate physics and astronomy majors. Similarly, if funded, we would expect the NSF S-STEM grant to provide scholarships for 8-10 students per year for three years. S-STEM scholarships would assist us in both recruiting students to and retaining students in the chemistry major.

Q5.3 Data have been provided on the unit's three-year trend in student credit hour (SCH) production.

Units should address any programs with a negative trend in SCH production.

Here we address the declines and offer ideas for increasing SCH production linked to our service courses. Our declines may be attributable to factors including: (i) declining student enrollment across WVU, (ii) declining repeated enrollment associated with reduced DFW repeats in our courses, (iii) enrollment shifts away from majors that require extensive chemistry courses. The specific decline in the chemistry major is off-set by the growth of the biochemistry, neuroscience, and other interdisciplinary majors that rely heavily on chemistry courses for their curriculum. Many other majors also rely on 100- and 200-level chemistry service courses, including majors in engineering, health sciences, agriculture, etc. Most of these programs have not significantly changed their expectations for taking our courses, so we presume that demand for our courses across the WVU student population remains fairly constant, with the possible exception of any majors that now require less chemistry than before.

Another potential SCH production factor, which we have only begun to consider and weigh, is that online offerings of chemistry courses and labs at other institutions might be drawing transient enrollment of WVU students away from our main campus courses. We have resisted offering courses online because we share the perception of ACS (our accrediting body) that online offerings are not an appropriate substitute for in person chemistry courses, especially as it pertains to teaching labs. However, ACS has relaxed its stance on online labs, now permitting one online introductory lab experience, provided that there is also an in-person lab that serves as the prerequisite for Foundational majors courses. Because most of our SCH production comes from non-majors, we have begun discussions with other units who require chemistry courses as to whether they accept online chemistry labs. Some do; some don’t. For those that do, we could consider increasing our online lab offerings as a way to recover SCH production that might otherwise go elsewhere (and reducing our costs). On the other hand, programs that accept and/or offer online chemistry courses and labs might only enjoy short-term gains in enrollment, before the broader community recognizes the limited pedagogical value of online chemistry training.

In any case, we should reduce our offerings of in-person service courses to save money and create efficiencies. As noted above, our number of section offerings has increased while our faculty numbers and SCH production have declined. A reduction in STEM service course offerings would help us manage faculty attrition while minimizing negative impacts to our PhD program and potentially create workload opportunities to improve recruiting and retention in the

chemistry major. One would have to monitor student success data carefully, including both DFW rates in individual sections and student performance in subsequent courses.

We also need to reduce DFW rates. As noted above, we have made progress with CHEM 110 and CHEM 115, reducing DFW rates in AY22-23 by 22.4% and 6.0%, respectively, relative to the three years preceding (Fall 2019-Spring 2022). We have invested considerable resources and faculty workload in revising the CHEM 110 course, including most recently to focus on student understanding of the particulate nature of matter. Chemical education research indicates that an understanding the particulate nature of matter meaningfully carries forward into success in future chemistry courses. In addition, the newest CHEM 110 pedagogy fosters an iterative practice-retrieval process to assist students in mastering the basics resulting in growth in the chunk size of their working memory. Student engagement is fostered through in-class formative assessment questions and homework question pools delivered through ecampus (1800+ questions) to assist students in recognizing and understanding concepts. The result has been a dramatic decrease in the CHEM 110 DFW rate, from as high as 70% (or higher, going back to when CHEM 110A/110B was taught as a two-course, one-semester sequence) to now more in the range of 30-40%, with additional room for improvement. (It is worth emphasizing the implication of these gains: we are now able to get most underprepared students ready for college-level chemistry in a single semester.) We track student performance across multiple courses in sequence, to make sure that declining DFW rates in one course do not translate into increasing DFW rates in the next. Students who pass CHEM 110 continue to outperform students who place directly into CHEM 115, which suggests that more students passing CHEM 110 has ripple effects that actually also improve DFW rates in CHEM 115.

Two concurrent changes may also factor into the lower DFW rates. Enrollment per section has dropped, as noted above. We also began replacing the lowest exam grade earned in CHEM 115 by the grade on the final exam for students whose final exam grade was higher than for an earlier exam. This practice is used to promote equity in assessment and to reward students for learning from their mistakes on an intermediate assessment (i.e., a formative exam). These concurrent changes could also be influencing our DFW rates, although we do not see them as major drivers of improved student learning in our large-lecture courses.

A simple curricular change/correction would increase our SCH production at no cost. We propose changing CHEM 110 from 2 credits to 3 credits; CHEM 110 is already taught as a 3-credit course. The primary reasons for this proposed credit hour increase are pedagogy and equity, although the financial impact is acutely relevant here: based on total AY2023 enrollment of 935 in this course, this change would increase our annual SCH production by up to 935, which in turn would increase our net tuition revenue. On the equity side, course content and workload for CHEM 110, for both the enrolled students and the instructors teaching the class, are equivalent to a 3-credit class. The course meets on the 3-credit schedule (e.g., 3 x 50 min weekly in-person lectures). Students are expected to put the same amount of work, effort, and time into CHEM 110 as they would for a corresponding 3-credit course in any discipline. Self-reporting data from Fall 2022 Chem 110 students indicates that they devote an average of 7.56 hours per week to attending and studying for the CHEM 110 course, which is more than for

many 3-credit courses. Instructors also put in the same amount of work, effort, and time for CHEM 110 as for a large-lecture 3-credit course. It is appropriate and equitable for students and instructors to make Chem 110 a 3-credit course, commensurate with its typical 150-minute weekly instructional meeting times.

Chemistry should be — and is — central to the recruiting and retention of STEM students at WVU. If our declining SCH production is associated with declining WVU enrollment, then recruiting in chemistry should be a priority.

End of Block: Student Enrollment

Start of Block: Curriculum, Assessment, and Program Improvement

Q6.1
Assessment of Learning and Program Improvement

The Provost's Office will review the self-studies from the most recent Board of Governor's five-year program reviews for this section.

Units may provide updated information below if they so choose.

Q6.2 Provide the unit's plans or ideas to make significant changes to its operations, structure, offerings, or personnel in order to reduce its costs or improve its efficiency.

Provide any significant changes to the department's program curricula, its assessment of learning practices, or any other improvements that have been made since the department's programs completed their most recent Board of Governor's five-year review.

Since our 2022 BOG review, we have continued to assess student learning in our current course offerings. For example, in Fall 2022, all of our CHEM 233 instructors pre-/post-tested 329 students on five major organic content topics, with an average improvement of 3.3/5 (75%) knowledge improvement. In Spring 2023, we assessed our departmental undergraduate advising of chemistry majors to determine its effectiveness. Undergraduate chemistry majors at all academic levels were encouraged to complete an anonymous advising survey via three email invitations over a 2-week time period. The survey indicated that our chemistry majors are comfortable with the current undergraduate advising arrangements in our department. As a reminder, a 9-month instructor serves as the academic advisor for all chemistry majors in addition to teaching (1 course per semester) and other administrative duties. In addition, our

course instructors will work with Stephanie Young, incoming Director of the Foundational STEM Collaborative (FSC). Dr. Young is an expert on assessment. We will work collaboratively with her and the FSC to use assessment results to identify points of intervention to enhance the student experience while improving content knowledge attainment and retention.

Looking forward, we offer plans and ideas for significant changes to operations and curriculum to reduce costs and improve efficiencies. Operations changes that would decrease our yearly operating budget — including through absorbing the faculty and staff attrition alluded to above as well as cutting materials and supplies costs — would be to transition some of our 100-level teaching labs online. We could start in Spring 2024 by moving CHEM 111L and 112L online, discontinuing parallel offerings of CHEM 115L on the downtown (Clark Hall) and Evansdale (NRCCE) campuses, and closing the satellite CHEM 115L labs at NRCCE. All chemistry labs, including the vast majority of CHEM 115L sections, are offered in Clark Hall, where labs are supported by infrastructure including lab staff, a chemistry stockroom, and two prep room facilities. The satellite CHEM 115L labs on Evansdale campus require redundant staffing and supplies while serving a relatively small number of students (~347 SCH in FY2023) at a disproportionately high cost per SCH, including because NRCCE labs accommodate fewer students per section. Moving CHEM 111L and 112L online would save on materials and supplies for those courses while opening space to accommodate more CHEM 115L students in Clark Hall, for additional savings. Moving CHEM 115L lab online (eg in Summer 2024) would then further reduce costs, but would require significant curriculum review and overhaul. Some majors (including ours) require in-person lab experiences as part of introductory coursework; we could address these requirements in collaboration with other stakeholders with parallel revisions of CHEM 116 and 116L, for example. We spend about $150k per year on consumables for the 100-level teaching labs, with the bulk of this coming in CHEM 115L. Moving CHEM 111L, 112L, and 115L online would save an estimated $100k per year.

We have been reviewing ways to streamline and modernize our curriculum, and we propose to embark on substantial overhaul of our BA/BS curricula starting this year. The ACS (our accrediting body) revised Guidelines for Undergraduate Chemistry Programs in January 2023. Our faculty, guided by ACS and our Undergraduate Studies Committee and informed by the new Foundational STEM Collaborative (FSC), will work together to revise the undergraduate curriculum to ensure that our BS in Chemistry major (i) continues to meet or exceed the 2023 ACS guidelines, (ii) incorporates significant changes to the ACS guidelines since 2015, and (iii) undertakes curriculum review including where our current curriculum discourages students from enrolling and/or persisting in the chemistry major.

Having reflected on our current program and discussed major curriculum changes within and beyond our faculty, we are excited to move forward and make the chemistry majors more relevant and compelling to incoming students while continue to serve various stakeholders across campus (i.e., other programs/majors that require our courses). We propose a year-long process of systematic curriculum review that includes input from the FSC, administration, representative stakeholders, faculty, and students. We will address significant changes in the 2023 ACS guidelines, including as related to computational chemistry; polymers and other

supramolecular structures and materials; and enhanced focus on safety, lab skills, pedagogy, and diversity, equity, inclusion and respect. In addition, we will address recruiting and retention issues with our curriculum. For example, the ACS-certified BS degree requires math through Calculus III and two calculus-based physics courses, which can create mapping problems for students. We will consider adding a non-ACS certified BS option in Chemistry that would require math through Calculus II and non-calculus based physics, such that Calculus can be deferred to the JR/SR year. Any such changes would be data-driven, vetted through various stakeholders, and informed by chemistry curricula at peer institutions. We expect to complete a draft of BA/BS curriculum reform ideas by the end of Spring 2024 and then move toward implementation.

A curriculum overhaul could streamline our course offerings and eliminate superfluous content for specific student populations. For example, many pre-med students take both CHEM 233 and 234 in preparation for the MCAT, although many medical schools only require one semester of organic chemistry. Meanwhile, our one-semester organic chemistry survey course (CHEM 231) serves exclusively non-majors, but could be reformed as a one-semester organic chemistry Foundational course that covers the content needed to prepare pre-med students for the MCAT and meets ACS degree requirements for the BS major. The overlapping courses of 231, 233, and 234 could thus be replaced by two courses (e.g., 231 and a new 331), eliminating redundancies in classroom and lab instruction and providing a more intimate experience for our chemistry majors in the second-semester, in-depth course in organic chemistry (e.g,, the above-referenced CHEM 331). The net results would be fewer courses, fewer sections, lower lab costs, a better experience for our majors, and easier progression to degree for majors and non-majors alike. The downsides include concerns about reduced rigor overall in our major — which would have to be reviewed and addressed at other points in the curriculum overhaul — and the workload effort and innovation required to develop an appropriate one-semester Foundational / survey course that appropriately serves multiple constituencies. This would take time and energy, but in conjunction with other efficiencies, we are confident that it can be done at no additional short-term costs and with potentially substantial long-term savings and gains in recruiting, retention, and student success.

Q6.3 The program may provide additional evidence of program improvement here.

End of Block: Curriculum, Assessment, and Program Improvement

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Start of Block: Supplementary Evidence

Q7.1 The unit may provide any additional context or information about the unit's programs here.

As we complete our self-study and think about ways to reduce costs, increase efficiencies, and reverse downward enrollment trends, we note that courses uniquely serving BA/BS Chemistry majors have minimal impact on our overall department offerings and finances. As noted previously (Q4.2) we only offer a small handful of courses specifically for BA/BS Chemistry majors, with >95% of our lecture and lab sections primarily serving other majors and/or also supporting our PhD program. Our graduate program has been growing. Our

declining SCH production is driven by declining enrollment in our STEM service courses. Nonetheless, we are concerned about the declining enrollment specifically in our majors — the focus of this review — and we are motivated to make our programs more relevant, more compelling, and more efficient in their progress to degree, without compromising the historic strength of chemistry degrees in future employment.

Here we offer additional plans to reduce administrative costs and regrow our majors by creating more compelling and marketable curricula at no additional costs and with significant long-term gains projected in faculty-to-majors ratios. Recent declines in the number of chemistry majors coincided with the growth of interdisciplinary STEM majors including Biochemistry, Neuroscience, Forensic Chemistry, Immunology, and Medical Microbiology. Interdisciplinary majors can be compelling and attractive for students. While we support these majors, their success highlights opportunities for us to help reduce WVU administrative cost and improve our unit's marketing, recruiting, and retention.

We can reduce WVU administrative costs and increase the size of BA/BS programs within our larger unit by incorporating administration of the Intercollegiate Biochemistry Program into and among our undergraduate major programs. Many universities offer undergraduate biochemistry degrees through their chemistry departments. The current Director of Intercollegiate Biochemistry (Legleiter) is in Chemistry; our courses contribute significantly to the curriculum; we advise about half of the Biochemistry majors through our Department (~85/170); and we are responsible for accreditation and reporting of the ACS-track in Biochemistry (and could the same for ASBMB accreditation). Currently at WVU, undergraduate students can earn a BS in Biochemistry with two different tracks: ACS (focused on chemistry) and ASBMB (focused on molecular biology). This two-track program may be unique and is an asset in recruiting students to WVU. Students in either track enroll in a minimum of 28 credits of chemistry coursework (Chem 115/115L, 116/116L, 215/215L, 233/233L, 234/234L, 341/341L, and 462/462L), and students in the ACS-track take a minimum of 40 credit hours of chemistry coursework.

With the Biochemistry major in our unit, we could recapture biochemistry-focused students and more easily recruit additional students through new interdisciplinary BS majors like Pharmaceutical Chemistry. We already provide courses that serve a variety of pre-health and pre-professional programs, including Pharmacy (direct admit and professional). Pre-pharmacy students might benefit from a BS Pharmaceutical Chemistry major that caters to their needs and supports their career goals as they progress through to the Pharmacy Professional program.

With majors like Biochemistry and Pharmaceutical Chemistry incorporated into our programs — at no additional costs and with some projected administrative cost savings — we would be poised to rebrand our department in a way that better reflects our vision of foundational and interdisciplinary excellence in the molecular sciences. For example, many chemistry departments have rebranded as Departments of Chemistry and Biochemistry, which we could do. Alternatively, the C. Eugene Bennett Department of Chemistry and *Molecular* Biochemistry (BCMB) would represent our historic strengths, rigor, breadth of expertise, and

compelling interdisciplinary programming that could better recruit students nationally to WVU. (A quick Google search identified many Departments of Chemistry and Biochemistry, but none of Molecular Biochemistry.) Molecular Biochemistry would differentiate us nationally among undergraduate programs and within WVU from the HSC Department of Biochemistry and Molecular Medicine.

Ultimately we aspire to develop more compelling offerings that differentiate us nationally and help recruit additional students to WVU. One way to make our majors more relevant and compelling is to restructure and streamline our curricula to accelerate progress to degree while maintaining ACS accreditation. Examples might include combining upper-level lectures and labs into single lecture/lab combined courses, replacing entry-level labs with higher-level hands-on experiences, and/or creating more upper-level major options that overlap with our PhD program curriculum. Another simple, no-cost way to add more compelling offerings in light of our recent decline in SCH production is to replace some of our recently added service course sections with popular majors-focused courses like Environmental Chemistry, Advanced Synthesis Lab, and combined Honors/Majors sections, which have been cut in recent years in order to expand our service course offerings. Curriculum overhaul has been an aspirational priority for our faculty for several years. This program review and self-study is an opportunity move forward that conversation and process and help reverse the specific decline in chemistry majors while maintaining our strength in STEM service teaching, research operations, and PhD programs.

Q7.2 You may use this section to provide any additional evidence referenced in the program review.

Q7.3 You may use this section to provide any additional evidence referenced in the program review.

Q7.4 You may use this section to provide any additional evidence referenced in the program review.

End of Block: Supplementary Evidence

Start of Block: End of Survey

Q8.1
Thank you for completing your self-study for the West Virginia University Board of Governors program review. You may now submit the survey and your self-study will be passed on to the Provost's Office for review.

End of Block: End of Survey
