

**Utah System of Higher Education
New Academic Program Proposal
Cover/Signature Page - Full Template**

Institution Submitting Request: University of Utah
Proposed Program Title: Biochemistry BA/BS
Sponsoring School, College, or Division: College of Science
Sponsoring Academic Department(s) or Unit(s): Department of Chemistry
Classification of Instructional Program Code¹ : 26.0202
Min/Max Credit Hours Required to Earn Degree: 122 / 122
Proposed Beginning Term²: Fall 2020
Institutional Board of Trustees' Approval Date:

Program Type (check all that apply):

<input type="checkbox"/> (AAS)	Associate of Applied Science Degree
<input type="checkbox"/> (AA)	Associate of Arts Degree
<input type="checkbox"/> (AS)	Associate of Science Degree
<input type="checkbox"/>	Specialized Associate Degree (specify award type ³ :)
<input type="checkbox"/>	Other (specify award type ³ :)
<input checked="" type="checkbox"/> (BA)	Bachelor of Arts Degree
<input checked="" type="checkbox"/> (BS)	Bachelor of Science Degree
<input type="checkbox"/>	Professional Bachelor Degree (specify award type ³ :)
<input type="checkbox"/>	Other (specify award type ³ :)
<input type="checkbox"/> (MA)	Master of Arts Degree
<input type="checkbox"/> (MS)	Master of Science Degree
<input type="checkbox"/>	Professional Master Degree (specify award type ³ :)
<input type="checkbox"/>	Other (specify award type ³ :)
<input type="checkbox"/>	Doctoral Degree (specify award type ³ :)
<input type="checkbox"/>	K-12 School Personnel Program
<input type="checkbox"/>	Out of Service Area Delivery Program

Chief Academic Officer (or Designee) Signature:

I, the Chief Academic Officer or Designee, certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the Commissioner.

Please type your first and last name _____ Date: _____

☐ I understand that checking this box constitutes my legal signature.

¹ For CIP code classifications, please see <http://nces.ed/ipeds/data/cipcodes/Default.aspx?y=55>

² "Proposed Beginning Term" refers to first term after Regent approval that students may declare this program.

³ Please indicate award such as APE, BFA, MBA, MEd, EdD, JD

**Utah System of Higher Education
Program Description - Full Template**

Section I: The Request

University of Utah requests approval to offer the following Baccalaureate degree(s): Biochemistry BA/BS effective Fall 2020. This program was approved by the institutional Board of Trustees on .

Section II: Program Proposal

Program Description

Present a complete, formal program description.

Chemistry plays a central role in uncovering molecular level details that the principles that underpin virtually any process on earth and beyond. Students who receive a degree in Chemistry at the University of Utah are prepared for wide variety of opportunities. At present, the Department offers 10 emphases within the degree that permit students to further specialize in preparation for a variety of careers. Among these, the biological emphasis, in which students specialize in the chemical aspects of life processes is the largest, constituting >60% of the majors in the department. This area is, by far, the fastest growing emphasis within the department, which underscores intense interest in understanding the role that chemical principles play in life processes. However, because it is currently offered as an emphasis, it does not provide students an opportunity to further customize a degree in Biochemistry to meet their educational goals.

We are proposing to establish new BS/BA degrees in Biochemistry in the Department of Chemistry at the University of Utah. This degree will incorporate core courses in chemistry, math, and physics. However, it will be distinct from the Biology emphasis in that it will provide significant flexibility to the students to fashion the degree to meet their educational objectives. This will be achieved by removing more specialized courses in the chemistry sub-disciplines in favor of courses that further explore biophysical and biochemical aspects of life processes at the molecular level, and elective offerings that provide depth and breadth.

A student who receives a Biochemistry degree will be prepared to enter the workforce in a wide variety of areas that include pharmaceutical sciences and biotechnology, or to pursue advanced degrees in the biochemical sciences, broadly defined.

Consistency with Institutional Mission

Explain how the program is consistent with the institution's Regents-approved mission, roles, and goals. Institutional mission and roles may be found at higheredutah.org/policies/policy312/.

The mission of the University of Utah, as defined the Board of Regents is to "fosters student success by preparing students from diverse backgrounds for lives of impact as leaders and citizens ... generate and share new knowledge, discoveries, and innovations" by engaging in activities to promote education, health, and quality of life. The Biochemistry degree will provide students with an interest in the molecular life sciences the tools to become engaged in activities that will lead to advances in this area.

Section III: Needs Assessment

Program Rationale

Describe the institutional procedures used to arrive at a decision to offer the program. Briefly indicate why such a program should be initiated. State how the institution and the USHE benefit by offering the proposed program.

The explosive growth in enrollment in the Biology emphasis of the Chemistry BS was the primary impetus to begin the discussion in the Chemistry department to offer a Biochemistry BS. This growth has also tracked with the large increase in enrollment in our Biological Chemistry course, with nearly 30% growth in the last 3 years alone. The enrollment in the Fall 2019 is 322.

We asked a simple question: what drives the popularity of the emphasis?

The University of Utah is unique among all Pac12 and Big10 school in that it does NOT offer a Biochemistry BS/BA. A survey of these institutions shows that all offer a degree in Biochemistry, which is housed either in a Department of Chemistry or a Department of Biochemistry (or equivalent) within their college of Agriculture or Science. All the schools in this group of institutions that have a medical school also have a Department of Biochemistry within the College of Medicine. However, nearly all such departments are entirely graduate degree conferring (Masters and PhD) and do not have any undergraduate teaching component.

The University of Utah and Utah State are both classified as Research Universities within the Utah System of Higher Education (see R312-4 in <https://higheredutah.org/policies/policyr312/>). In this category, the Chemistry department at the University of Utah has substantially more majors (434 versus 262 in 2018). At Utah State, nearly 50% of the majors in the Chemistry department (142/262) are earning a degree in Biochemistry. At the University of Utah, 63% are enrolled in the Biology concentration, but unlike at Utah State, do not have a path to a Biochemistry BS or BA. It should be noted that the Chemistry department at the U is the largest chemistry program, in terms of majors, among the higher education institutions in the state of Utah. On the basis of these data, we concluded that the significant numbers of students who declare the Chemistry department's Biology emphasis do so because this is the closest that the U offers to a Biochemistry degree. *Not providing a Biochemistry BS/BA is a disservice to the student population at the University of Utah.*

The second component of our discussion was whether a standalone degree would not better serve the student population at the U. We anticipate the enrollment in the biological emphasis of the Chemistry degree to stay strong. This is an American Chemical Society (ACS) certified degree which is designed for the student who is largely interested in Chemistry, but also has an interest in life processes. The emphasis was not designed to accommodate students who wish more flexibility in their degree path to fashion a program of study that meets their educational goals by providing opportunities to integrate coursework in biochemistry and allied fields.

After examining all these factors we concluded that a degree in Biochemistry would provide an educational pathway that would better suit some of our existing students, who for various reasons are unable to attend other institutions of higher education. Moreover, it would also make the U competitive in the landscape of both state and national institutions, positioning us to

attract additional students who would normally not come to us, or leave the state and obtain their Biochemistry BS degree elsewhere. Therefore, a Biochemistry BS/BA degree would put the U on an equal footing with other higher education programs and Chemistry departments in the State and beyond.

The faculty in the Department of Chemistry discussed this proposal in the course of two faculty meetings. In the first, we looked at the data on historical/current enrollment and potential course options. We carefully evaluated the coursework in the degree to determine which should be required, and where there could be flexibility in the program to accommodate students' interests. In the second faculty meeting we finalized the course offerings and voted to offer the program. The proposal was approved unanimously by all the faculty who were present (final vote: 26 in favor, 0 not in favor, 0 abstentions); six faculty members were absent.

Labor Market Demand

Provide local, state, and/or national labor market data that speak to the need for this program. Occupational demand, wage, and number of annual openings information may be found at sources such as Utah DWS Occupation Information Data Viewer (jobs.utah.gov/jsp/wi/utalmis/gotoOccinfo.do) and the Occupation Outlook Handbook (www.bls.gov/oco).

This proposal establishes a BS in Biochemistry at the University of Utah. Graduates with the degree will be well positioned to enter the workforce in any area of the biochemistry and allied disciplines, broadly defined. The State projects 2-4% annual growth rates for openings in the areas that encompass this degree between 2016 and 2026. Therefore, students receiving a degree in Biochemistry are in an excellent position to help reach the 66% by 2020 pledge by the governor, ensuring that Utahns age 20-64 have a post-secondary degree, ensuring a well-educated citizenry and workforce that meets the needs of Utah employers, ultimately increasing economic prosperity and quality of life in the State.

Student Demand

Provide evidence of student interest and demand that supports potential program enrollment. Use Appendix D to project five years' enrollments and graduates. Note: If the proposed program is an expansion of an existing program, present several years enrollment trends by headcount and/or by student credit hours that justify expansion.

The student demand for a Biochemistry BS/BA at the University of Utah may be gleaned by examining the current distribution of majors within Chemistry emphases. The department currently offers 10 emphases. The majors in each of these is listed below.

Emphasis	2018	2017	2016	2015	2014
Atmospheric and Environmental	7				
Biology	277	254	225	216	211
Business	23	25	26	26	23
Chemical Engineering	19	24	22	14	1
Geology	10	11	12	11	3
Materials Sci and Eng	18	13	14	11	5
Math	19	22	13	7	5
Physics	17	16	15	15	12
Professional	42	44	52	58	59
Teaching	8	10	7	5	5
Total	440	419	386	363	324

As is clear from the data above, we have seen significant growth over the last 5 years in the Biological emphasis, which is most aligned with the Biochemistry BS/BA. The student demand in this area is not met by any other department either on the main or medical school

campus. If current data are any indication, we anticipate 5-10% growth in the biological area over the next few years.

Similar Programs

Are similar programs offered elsewhere in the USHE, the state, or Intermountain Region? If yes, identify the existing program(s) and cite justifications for why the Regents should approve another program of this type. How does the proposed program differ from or compliment similar program(s)?

We have surveyed all of the USHE institutions for a similar program. All other institutions in the USHE offer either a stand-alone degree in Biochemistry, or an emphasis in an allied discipline often from within the Chemistry department. As indicated above, it is commonplace within the Big10 and Pac12 to offer a Biochemistry BS. The absence of a Biochemistry BS at the University of Utah is an aberration nationally and within the state, but one that this proposal will remedy.

Collaboration with and Impact on Other USHE Institutions

Indicate if the program will be delivered outside of designated service area; provide justification. Service areas are defined in highereducation.org/policies/policy315/. Assess the impact the new program will have on other USHE institutions. Describe any discussions with other institutions pertaining to this program. Include any collaborative efforts that may have been proposed.

The Biochemistry BS/BA program proposed here follows the standard of practice for Biochemistry BS degrees across the nation. As indicated above, such a degree is present in many Chemistry departments nationally. We do not anticipate that it will compete with other USHE institutional programs, or with BYU, which is a private institution. Enrollment levels in the program offered by the Chemistry department relative to sister institutions will largely be dictated by external factors that are unique to each student.

External Review and Accreditation

Indicate whether external consultants or, for a career and technical education program, program advisory committee were involved in the development of the proposed program. List the members of the external consultants or advisory committee and briefly describe their activities. If the program will seek special professional accreditation, project anticipated costs and a date for accreditation review.

The Biochemistry BS will undergo accreditation by the American Society for Biochemistry and Molecular Biology (ASBMB). The society receives applications once a year in the fall (usually October 1st) and reviews them in a study section that takes place in mid-to-late November or early December. Decisions are announced in late December (within three months of application). The approval is good for seven years. New programs are typically approved provisionally for 3 years.

The accreditation committee examines three areas: curriculum, faculty, and institution.

Curriculum: The curriculum is examined for content and the presence of core concepts, as defined by ASBMB. Successful programs will include a minimum of 400 laboratory hours, and include skills that go beyond basic science to include oral and written communication,

teamwork, safety, and ethics.

Faculty: Certified programs require a minimum of three faculty to provide sufficient breadth and research experiences. The Department already has a significant presence in the area of biochemistry, broadly defined, with at least 12 research active laboratories (<https://chem.utah.edu/research/biological.php>).

Institution: The University of Utah is fortunate to be designated as a R1 institution and so has all the expected facilities for teaching and research, and a robust student base. The University has demonstrated substantial commitment to diversity and inclusion. In addition, student advising, both academic and career, are present either within the department or in the University at large.

To receive an ASBMB-certified degree in Biochemistry, students must take an exam that is administered and graded by ASBMB. Students in newly accredited programs are eligible to participate in the certification exam process the year immediately after application (in January). Costs associated with the exam will be incurred by the Department.

Section IV: Program Details

Graduation Standards and Number of Credits

Provide graduation standards. Provide justification if number of credit or clock hours exceeds credit limit for this program type described in R401-3.11, which can be found at highereducation.utah.gov/policies/R401.

Students earning a BS/BA in Biochemistry will complete 79 units (72 core + 7 electives) in the major, as well as university-wide General Education and Bachelor degree requirements. All the requirements can be met within the University's required 122 credits.

Students earning the degree will receive didactic and laboratory experiences in the degree as per the ASBMB guidelines for the degree (see Student Standards section). The Department will seek accreditation and submit to reviews, as necessary, to maintain accreditation.

Admission Requirements

List admission requirements specific to the proposed program.

Admission to the program will be handled as it is for the Chemistry BS/BA degree. Students will self-select and declare the major as appropriate. The major will not have any specific entrance examinations.

Curriculum and Degree Map

Use the tables in Appendix A to provide a list of courses and Appendix B to provide a program Degree Map, also referred to as a graduation plan.

Section V: Institution, Faculty, and Staff Support

Institutional Readiness

How do existing administrative structures support the proposed program? Identify new organizational structures that may be needed to deliver the program. Will the proposed program impact the delivery of undergraduate and/or lower-division education? If yes, how?

The Department already offers all the core courses and has the support structure to manage the new degree. The new BS/BA will not impact the delivery of existing curriculum, degrees, or emphases. We will not be deactivating the Biology emphasis, as it is appropriate for students who desire a Chemistry degree with some more biological electives.

Faculty

Describe faculty development activities that will support this program. Will existing faculty/instructors, including teaching/graduate assistants, be sufficient to instruct the program or will additional faculty be recruited? If needed, provide plans and resources to secure qualified faculty. Use Appendix C to provide detail on faculty profiles and new hires.

The degree will share core coursework with the existing departmental programs, which are supported by 25 tenured, 8 tenure track, and 4 career line lecturers (<https://www.obia.utah.edu/data/other-datatoolsresources/faculty-information-resource/>). We do not anticipate the need for new faculty hires to support the degree.

Staff

Describe the staff development activities that will support this program. Will existing staff such as administrative, secretarial/clerical, laboratory aides, advisors, be sufficient to support the program or will additional staff need to be hired? Provide plans and resources to secure qualified staff, as needed.

The existing staff within the department will support this new BS/BA degree. Students will be advised by our departmental advising office. Additional staff will not be needed for this new degree.

Student Advisement

Describe how students in the proposed program will be advised.

There are currently two advisors that split time between the Department and the College of Science, who advise our students. The core of the degree is largely similar to existing programs and the advisors are therefore well versed in helping students select coursework and plan their educational research program. Students are required to meet with the advisors one each year. In addition, all students also attend a 1-credit hour seminar that introduces them to the various chemistry majors and University resources that will support their educational and career goals. Therefore, the advising office is already in place to support the new degree.

Library and Information Resources

Describe library resources required to offer the proposed program if any. List new library resources to be acquired.

The Marriott Library has an extensive collection of relevant publications (electronic and print), as well as texts in the area of Biochemistry. The Department also supports a computer lab, which provides both access to computing as well as printing. New library resources will not be required.

Projected Enrollment and Finance

Use Appendix D to provide projected enrollment and information on related operating expenses and funding sources.

Section VI: Program Evaluation

Program Assessment

Identify program goals. Describe the system of assessment to be used to evaluate and develop the program.

Program Goals

- 1) To deliver rigorous curriculum to provide knowledge base that highlights the chemical and molecular basis of life processes.
- 2) To provide flexibility for students to tailor a course of study that emphasizes aspects of biochemistry that intersect with their interests and best prepares them for careers in research, biotechnology, teaching, medicine, and allied fields.

Student Standards of Performance

List the standards, competencies, and marketable skills students will have achieved at the time of graduation. How and why were these standards and competencies chosen? Include formative and summative assessment measures to be used to determine student learning outcomes.

STUDENT STANDARDS

The American Society for Biochemistry and Molecular Biology has well established core standards and competencies for a student who is earning a BS/BA degree in Biochemistry. The Society defines core competencies and standards in the following areas:

Core concepts and learning objectives: The elements of the curriculum must fit into one or more core concepts listed below:

- 1) Energy is required by and transformed in biological systems
- 2) Macromolecular structure determines function and regulation
- 3) Information storage and flow are dynamic and interactive
- 4) Discovery requires objective measurement, quantitative analysis, and clear communication.

The core concepts 1-3 are integral to the year-long CHEM 3510/3520 series, which introduces biological molecules, properties, transformations, and energetics. Measurement, quantitative analysis, and clear communication are integrated into the entire curriculum.

Experiential learning: An ASBMB recognized program requires participation in a cumulative total of 400 or more contact hours of hands-on lab experiences in the STEM areas over the course of the degree. At least one is preferably research/inquiry-based. The lab components must give explicit and regular attention to all aspects of lab safety and ethical conduct of research.

Chemistry and Biochemistry are both “lab-heavy” degrees. From the first day in our program to the last, students integrate lab and lecture. Laboratory components of the degree will include those in general chemistry, organic chemistry, quantitative analysis, biological chemistry, and elective advanced labs. In addition, students have the opportunity to do research in any STEM area either in the department, or throughout the University. Independent study credit is available for these experiences. We estimate that in laboratory courses alone the students will

have ~435 contact hours in laboratory coursework.

Communication skills: Oral and written communications are essential to scientific communication. The ASBMB-accredited program is expected to afford students training in written and electronic communication in areas that include:

- 1) Reading and consistent adherence to laboratory procedures
- 2) Scientific record-keeping, which include maintaining accurate records in scientific notebooks
- 3) Preparation of laboratory reports
- 4) Other writing activities, which may include preparing proposals, grant applications, writing intensive projects, etc.
- 5) Opportunities for oral presentations

By its nature, the major includes substantial training in communicating scientific results. Students regularly prepare laboratory reports and are expected to maintain accurate records of laboratory experiments. These extend to any students who choose to conduct research and receive credit for independent study in the department. Undergraduate researchers participate in the UROP program and poster sessions each year. The Department of Chemistry already has an American Chemical Society student chapter, which regularly supports student attendance at the National/Regional meetings. It is our goal that along with the degree, the Department will also seed an ASBMB affiliate program geared for students who have an interest in biochemistry and allied fields. The affiliate network can receive funds from the ASBMB to support travel to the ASBMB annual meeting, where substantial resources are devoted every year to undergraduate enrichments activities that include poster sessions, career advice, etc. In addition, these affiliate networks (ACS or ASBMB) will encourage student teamwork, which is another component of recommended standards for the degree.

Research in undergraduate or professional settings – As stated above, research opportunities are freely available within the Department and across the STEM fields on campus. We will encourage these by setting up a STEM clearing house where faculty from across campus could advertise openings within their groups and disseminate the information through the Chemistry advising office to all interested students.

STUDENT REVIEW

The Department has initiated the move to a portfolio system to assess student progress through our curriculum. The program, which is slated for roll out in the 2020-2021 year will have two components as follows:

- 1) Portfolios: At the end of each semester, students will be asked to write a self-reflection for all lab and non-lab courses reflecting on how one or more component of the course related to their studies or interests. These will be reviewed by the faculty in the department and feedback will be provided to the student. Our hope is that the self-reflection will provide the students an opportunity to reflect broadly on the intersection of their life and educational goals. This is one component of the formative assessment for each course.
- 2) The Undergraduate Education Committee in the Department will be undertaking a program

to articulate learning objectives and outcomes for every course offered in the department, as a preamble to setup formative assessments that allow us to evaluate student progress through the degree. The assessments will include (but will not be limited to), for example, exam questions that are uniform across different sections of a course, or across 2-semester courses to assess learning outcomes within each semester, and longitudinally.

The summative assessment of the student performance will be carried out through the certification examination conducted by ASBMB on each graduating student (see External Review section). In addition, we will carry out Exit Surveys from the graduating seniors to help refine the program in future years to better meet student career and professional goals.

Appendix A: Program Curriculum

List all courses, including new courses, to be offered in the proposed program by prefix, number, title, and credit hours (or credit equivalences). Indicate new courses with an X in the appropriate columns. The total number of credit hours should reflect the number of credits required to be awarded the degree.

For variable credits, please enter the minimum value in the table for credit hours. To explain variable credit in detail as well as any additional information, use the narrative box at the end of this appendix.

Course Number	NEW Course	Course Title	Credit Hours
General Education Courses (list specific courses if recommended for this program on Degree Map)			
General Education Credit Hour Sub-Total			
Required Courses			
CHEM 1210		General Chemistry I	4
CHEM 1215		General Chemistry I lab	1
CHEM 1220		General Chemistry II	4
CHEM 1225		General Chemistry II lab	1
CHEM 2310		Organic Chemistry I	4
CHEM 2315		Organic Chemistry I lab	1
CHEM 2320		Organic Chemistry II	4
CHEM 2325		Organic Chemistry II lab	1
CHEM 3510		Biological Chemistry I	3
CHEM 3520		Biological Chemistry II	3
CHEM 3070		Thermodynamics	4
CHEM 2000/4000		Undergraduate seminar	1
MATH 1210		Calculus I	4
MATH 1220		Calculus II	4
MATH 2210		Calculus III	3
PHYS 2210		Physics I	4
PHYS 2215		Physics I lab	1
PHYS 2220		Physics II	4
WRTG 3014		Scientific Writing	3
BIOL 1610		Fundamental Principles of Biology I	3
Required Course Credit Hour Sub-Total			57
Elective Courses			
		Select one of the following courses	4
CHEM 3000		Quantitative Analysis (4 credits)	
CHEM 3100		Inorganic Chemistry (4 credits)	

Course Number	NEW Course	Course Title	Credit Hours
		Select three lab courses (CHEM 4800 will substitute for 2 credits)	6
CHEM 5700		Advanced Analytical lab (2 credits)	
CHEM 5710		Advanced Organic lab (2 credits)	
CHEM 5720		Advanced Physical Chemistry lab (2 credits)	
CHEM 5730		Advanced Inorganic lab (2 credits)	
CHEM 5750		Advanced Chemical Biology lab (2 credits)	
CHEM 3515		Biological Chemistry lab (2 credits)	
CHEM 3525		Molecular Biology DNA lab (2 credits)	
		Select one of the following courses	4
CHEM 3060		Quantum Chemistry (4 credits)	
CHEM 3090		Biophysical Chemistry (4 credits)	
		Select total of 8 credits from the list below	8
CHEM 5470		Nucleic Acid Chemistry (2 credits)	
CHEM 5810		Nanoscience (3 credits)	
CHEM 5450		Biophysical Chemistry (2 credits)	
CHEM 5460		Protein Chemistry (2 credits)	
CHEM 6740		Bioanalytical Chemistry (2 credits)	
BIOL 2020		Principles of Cell Biology (3 credits)	
BIOL 2030		Principles of Genetics (3 credits)	
BIOL 2210		Human Genetics (3 credits)	
Elective Credit Hour Sub-Total			22
Core Curriculum Credit Hour Sub-Total			79

Program Curriculum Narrative

Describe any variable credits. You may also include additional curriculum information.

The curriculum for the Biochemistry BA/BS degree is designed to afford the student maximum flexibility to tailor their studies to meet their educational/career goals. The curriculum provides depth and breadth in biochemistry and allied disciplines.

The first year curriculum consists of General Chemistry and Mathematics, which are prerequisites for subsequent semester. The students will start the 2-semester Physics sequence in the Spring. The Freshman seminar is designed to introduce the majors to the "Central Science." Topics include chemical literature, digital resources, career paths, science outreach, and special topics.

Students will complete the Physics and Math requirements in the Fall of Year 2. The Organic Chemistry

sequence is the major course sequence in Year 2. It is recommended that students complete BIOL 1610, which is a recommended prerequisite for CHEM 3510, as well as for some of the elective courses (such as BIOL 2020).

The third year coursework is comprised of the 2-semester sequence of Biological Chemistry, which introduces the students to the core of the Biochemistry discipline. In addition, they complete Thermodynamics and Kinetics, and select from among several upper division courses (Inorganic Chemistry or Quantitative Analysis, Quantum Chemistry or Biophysical Chemistry), to complete the core didactic requirements of the degree.

The final year is where students complete the laboratory requirements. We are leaving the choice of labs to individual students to tailor it to their interest and schedule. While up to 6 units of advanced laboratory credit will be required, up to 2 units could be substituted with undergraduate research or equivalent (CHEM 4800). We anticipate that students will also complete 7 units of electives in the fourth year.

In selecting the electives for the major, we were mindful to provide choices that provide breadth and depth. For example, students can obtain additional depth in the major with courses such as CHEM 5460 or 5450, which are advanced undergraduate/graduate courses in Protein Chemistry or Biophysical Chemistry. The breadth is obtained by including allied courses, such as BIOL 2020, in the elective options.

Degree Map

Degree maps pertain to undergraduate programs ONLY. Provide a degree map for proposed program. Degree Maps were approved by the State Board of Regents on July 17, 2014 as a degree completion measure. Degree maps or graduation plans are a suggested semester-by-semester class schedule that includes prefix, number, title, and semester hours. For more details see <http://higheredutah.org/pdf/agendas/201407/TAB%20A%202014-7-18.pdf> (Item #3).

Please cut-and-paste the degree map or manually enter the degree map in the table below.

First Year Fall	Cr. Hr.	First Year Spring	Cr. Hr.
CHEM 1210 General Chemistry I	4	CHEM 1220 General Chemistry II	4
CHEM 1215 General Chemistry I lab	1	CHEM 1225 General Chemistry II lab	1
CHEM 2000/4000 Undergraduate Seminar	1	PHYS 2210 Physics I	4
MATH 1210 Calculus I	4	PHYS 2215 Physics I lab	1
Option: CHEM 1211 Honors Gen Chem I		MATH 1220 Calculus II	4
		Option: CHEM 1221 Honors Gen Chem II	
Total	10	Total	14
Second Year Fall	Cr. Hr.	Second Year Spring	Cr. Hr.
CHEM 2310 Organic Chemistry I	4	CHEM 2320 Organic Chemistry II	4
CHEM 2315 Organic Chemistry I lab	1	CHEM 2325 Organic Chemistry II lab	1
MATH 2210 Calculus III	3	WRTG 3014	3
PHYS 2220 Physics II	4	BIOL 1610 Fundamental Principles of Biology I	3
PHYS 2225 Physics II lab	1	Option: CHEM2321 Honors Org Chem II	
Option: CHEM 2311 Honors Org Chem I			
Total	13	Total	11
Third Year Fall	Cr. Hr.	Third Year Spring	Cr. Hr.
CHEM 3000 Quantitative Analysis OR		CHEM 3090 Biophysical Chemistry OR	
CHEM 3100 Inorganic Chemistry	4	CHEM 3060 Quantum Chemistry	4
CHEM 3070 Thermodynamics	4	CHEM 3520 Biological Chemistry II	3
CHEM 3510 Biological Chemistry I	3	CHEM 35X5 Biochemistry lab	2
Total	11	Total	9
Fourth Year Fall	Cr. Hr.	Fourth Year Spring	Cr. Hr.
CHEM 35X5 Biochemistry lab	2	CHEM 57X0 Advanced lab	2
Total	2	Total	2

Appendix C: Current and New Faculty / Staff Information

Part I. Department Faculty / Staff

Identify # of department faculty / staff (headcount) for the year preceding implementation of proposed program.

	# Tenured	# Tenure -Track	# Non -Tenure Track
Faculty: Full Time with Doctorate	24	8	3
Faculty: Part Time with Doctorate			
Faculty: Full Time with Masters			
Faculty: Part Time with Masters			
Faculty: Full Time with Baccalaureate			
Faculty: Part Time with Baccalaureate			
Teaching / Graduate Assistants			6
Staff: Full Time			
Staff: Part Time			5

Part II. Proposed Program Faculty Profiles

List current faculty within the institution -- with academic qualifications -- to be used in support of the proposed program(s).

	First Name	Last Name	Tenure (T) / Tenure Track (TT) / Other	Degree	Institution where Credential was Earned	Est. % of time faculty member will dedicate to proposed program.	If "Other," describe
Full Time Faculty							
	Scott	Anderson	T	PhD	UC Berkeley	5	
	Peter	Armentrout	T	PhD	Caltech	5	
	Vahe	Bandarian	T	PhD	University of Wisconsin-Madison	5	
	Cynthia	Burrows	T	PhD	Cornell University	5	
	John	Conboy	T	PhD	University of Oregon	5	
	Richard	Ernst	T	PhD	Northwestern University	5	
	Michael	Gruenwald	TT	PhD	University of Vienna	5	
	Ming	Hammond	T	PhD	UC Berkeley	5	
	Joel	Harris	T	PhD	Purdue University	5	
	Matthew	Kieber-Emmons	TT	PhD	Stanford University	5	
	Bethany	Buck-Koehntop	T	PhD	University of Minnesota	5	
	Ryan	Looper	T	PhD	Colorado State University	5	
	Janis	Louie	T	PhD	Yale University	5	
	Joel	Miller	T	PhD	UCLA	5	
	Shelley	Minteer	T	PhD	Western Illinois University	5	
	Valeria	Molinero	T	PhD	Universidad de Buenos Aires	5	
	Michael	Morse	T	PhD	University of Chicago	5	
	Rodrigo	Noriega	TT	PhD	Stanford University	5	
	Aaron	Puri	TT	PhD	Stanford University	5	

	First Name	Last Name	Tenure (T) / Tenure Track (TT) / Other	Degree	Institution where Credential was Earned	Est. % of time faculty member will dedicate to proposed program.	If "Other," describe
	Jon	Rainier	T	PhD	UC Riverside	5	
	Thomas	Richmond	T	PhD	Northwestern	5	
	Andrew	Roberts	TT	PhD	UCLA	5	
	Caroline	Saouma	TT	PhD	Caltech	5	
	Jennifer	Shumaker-Parry	T	PhD	University of Washington	5	
	Matthew	Sigman	T	PhD	Washington State University	5	
	Peter	Stang	T	PhD	UC Berkeley	5	
	Ryan	Steele	T	PhD	UC Berkeley	5	
	Jessica	Swanson-Voth	TT	PhD	UCSD	5	
	Thanh	Truong	T	PhD	University of Minnesota	5	
	Henry	White	T	PhD	UT Austin	5	
	Luisa	Whittaker-Brooks	TT	PhD	SUNY	5	
	Ilya	Zharov	T	PhD	University of Colorado at Boulder	5	
Part Time Faculty							

Part III: New Faculty / Staff Projections for Proposed Program

Indicate the number of faculty / staff to be hired in the first three years of the program, if applicable. Include additional cost for these faculty / staff members in Appendix D.

	# Tenured	# Tenure -Track	# Non -Tenure Track	Academic or Industry Credentials Needed	Est. % of time to be dedicated to proposed program.
Faculty: Full Time with Doctorate					
Faculty: Part Time with Doctorate					
Faculty: Full Time with Masters					
Faculty: Part Time with Masters					
Faculty: Full Time with Baccalaureate					
Faculty: Part Time with Baccalaureate					
Teaching / Graduate Assistants					
Staff: Full Time					
Staff: Part Time					

Appendix D: Projected Program Participation and Finance

Part I.

Project the number of students who will be attracted to the proposed program as well as increased expenses, if any. Include new faculty & staff as described in Appendix C.

Three Year Projection: Program Participation and Department Budget						
	Year Preceding Implementation	New Program				
		Year 1	Year 2	Year 3	Year 4	Year 5
Student Data						
# of Majors in Department	418					
# of Majors in Proposed Program(s)	////	50	60	70	80	90
# of Graduates from Department	62					
# Graduates in New Program(s)	////	0	0	0	40	45
Department Financial Data						
	Department Budget					
		Year 1	Year 2	Year 3		
<i>Project additional expenses associated with offering new program(s). Account for New Faculty as stated in Appendix C, "Faculty Projections."</i>	Year Preceding Implementation (Base Budget)	Addition to Base Budget for New Program(s)	Addition to Base Budget for New Program(s)	Addition to Base Budget for New Program(s)		
EXPENSES – nature of additional costs required for proposed program(s)						
<i>List salary benefits for additional faculty/staff each year the positions will be filled. For example, if hiring faculty in year 2, include expense in years 2 and 3. List one-time operating expenses only in the year expended.</i>						
Personnel (Faculty & Staff Salary & Benefits)						
Operating Expenses (equipment, travel, resources)						
Other:						
TOTAL PROGRAM EXPENSES	////	\$0	\$0	\$0		
TOTAL EXPENSES	\$0	\$0	\$0	\$0		
FUNDING – source of funding to cover additional costs generated by proposed program(s)						
<i>Describe internal reallocation using Narrative 1 on the following page. Describe new sources of funding using Narrative 2.</i>						
Internal Reallocation						
Appropriation						
Special Legislative Appropriation						
Grants and Contracts						
Special Fees						
Tuition						
Differential Tuition (requires Regents approval)						
PROPOSED PROGRAM FUNDING	////	\$0	\$0	\$0		
TOTAL DEPARTMENT FUNDING	\$0	\$0	\$0	\$0		
Difference						
Funding - Expense	\$0	\$0	\$0	\$0		

Part II: Expense explanation

Expense Narrative

Describe expenses associated with the proposed program.

The Biochemistry BS/BA is structured to take advantage of existing courses offered in the Department of Chemistry. There will be no new expenses required to establish the program.

Part III: Describe funding sources

Revenue Narrative 1

Describe what internal reallocations, if applicable, are available and any impact to existing programs or services.

The course fees will provide the revenue required for the new major. The course fees are adequate to cover the cost of the new program.

Revenue Narrative 2

Describe new funding sources and plans to acquire the funds.

No new funds are being requested for the program.