Senate Reference No. 17-7

TO: Fort Wayne Senate

FROM: Kate White,
Chair, Curriculum Review Subcommittee

DATE: September 13, 2017

SUBJECT: Proposal for B.S. in Biochemistry

The Curriculum Review Subcommittee met on September 8, 2017 to review the attached proposal for a B.S. in Biochemistry.

The committee approved the proposal unanimously and therefore find that it requires no Senate review**.**

Approved	**Opposed**	**Abstention**	**Absent**
S. Baddam			
C. Duncan			
V. Maloney			
A. Montenegro			
S. Skekloff			
J. Smith			
K. White			
M. Yamada			
J. Yoo			

BACHELOR OF SCIENCE IN BIOCHEMISTRY
Indiana University Purdue University Fort Wayne (IPFW)
College of Arts and Sciences
Department of Chemistry
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1. Characteristics of the Program

a. **Campus Offering Program:** Indiana University Purdue University Fort Wayne (IPFW)
b. **Scope of Delivery (Specific Sites or Statewide):** IPFW
c. **Mode of Delivery (Classroom, Blended, or Online):** Classroom (includes lecture and labs); one required class (CHM 28000) is entirely online
d. **Other Delivery Aspects (Co-ops, Internships, Clinicals, Practica, etc.):** Seminars (for the required CHM 49600/49700)
e. **Academic Unit Offering Program:** Department of Chemistry in the College of Arts and Sciences

2. Rationale for the Program

a. Institutional Rationale (Alignment with Institutional Mission and Strengths)

- **Why is the institution proposing this program?**

  - The IPFW Chemistry Department is proposing a B.S. Biochemistry degree primarily to increase the number of graduates who enter healthcare/life sciences sectors of the economy and who are at the forefront of the field of Biochemistry. In addition, the degree will increase the visibility of the Chemistry Department and the university as having offerings that underpin one of the most vibrant sectors of the regional economy.

  - The IPFW Department of Chemistry does not currently offer a baccalaureate degree in biochemistry. (Such a proposed degree would be distinctly different from the currently-offered American Chemical Society (ACS) certified B.S. in Chemistry with the biochemistry option; the latter would be eliminated as a degree offering if this present proposal is approved.) The B.S. Biochemistry degree would raise the visibility and status of biochemistry within the department. In addition, the Department anticipates that, due to the differences in mathematics, physics and biology requirements between our current B.S. Chemistry degrees (including the ACS-certified degree) and the proposed B.S. Biochemistry degree, this proposed degree will result in a greater number of IPFW students matriculating as majors within our department.

- **How is it consistent with the mission of the institution?**

  - The proposed biochemistry degree aligns well with, and could even be considered necessary to, the Department's mission which states "The IPFW Department of Chemistry engages its students with the body of knowledge that is the modern Chemical Sciences" and "the course of study in the Department of Chemistry also forms the foundation for a career as a chemical professional and for advanced study in both graduate and professional schools." The biochemistry degree addresses our ability to prepare students for these post-graduate opportunities. Furthermore, the degree will have the effect of "modernizing" the department by offering a course of study known to be in demand in the area.

  - The mission of the IPFW College of Arts and Sciences includes a commitment to a "breadth of knowledge about the global environment and fosters an appreciation and respect for diversity. The College of Arts and Sciences equips students to think

critically, communicate effectively, and develop creative solutions to future challenges. The college cultivates the intellectual growth of its faculty, who dedicate themselves through excellence in teaching, research and creative endeavor, and service to the university and to the larger communities of which they are a part." The College mission's focus on "future challenges" aligns with the proposed degree since the degree will be preparing students to meet the current and future demands noted in academia and private sector hiring trends. The biochemistry degree also underpins the research interests of at least three current members of the Chemistry Department and thus builds upon one of the strengths of the department. Thus, having a strong, vibrant research element available to students has the dual effect of meeting the College's emphasis on faculty growth as well as fostering students' critical thinking in an increasingly important discipline.

- The mission of Indiana University Purdue University Fort Wayne includes: "(IPFW) is a comprehensive university that provides local access to globally recognized baccalaureate and graduate programs that drive the intellectual, social, economic, and cultural advancement of our students and our region." A biochemistry degree provides students access to global job offerings across all of biotechnology. This is because all of biotech-related opportunities rely on some component of biochemistry as part of their business model; from Research & Development to sales, students versed in biochemistry are ready for these career options. The degree will also prepare students with skills and abilities to seek the many graduate study opportunities available to students with the proposed training.

- **How does the program fit into the institution's strategic and/or academic plan?**

  - The proposed biochemistry degree aligns with four of the goals indicated in the 2014 – 2020 strategic plan (IPFW Plan 2020; see Appendix 1), in particular:

    - **Goal I.B.3** *Expand number of degree programs that have gateway courses.* (The general chemistry courses CHM 11500 and 11600 can be considered gateway courses for a number of degree programs.)
    - **Goal I.E.1** *Identify and develop signature programs that respond to regional needs, build on faculty expertise, and uniquely distinguish IPFW from other institutions.*
    - **Goal I.E.4** *Promote majors and programs with strong job placement opportunities in the region and beyond.*
    - **Goal IV.B.4** *Identify gaps in academic and program offerings and prioritize programs for creation, expansion, merging, or cessation.*

  - It should also be noted that in the May 6, 2016 University Strategic Alignment Process (USAP) report that the USAP task Force, in Section 3.5, pg. 25, recommended investing in the proposed program (USAP Report 2; see Appendix 1).

- **How does this program build upon the strengths of the institution?**

  - The IPFW Chemistry department currently has three Ph.D. faculty members who are qualified to teach the biochemistry courses proposed for the degree and who conduct research in the field of biochemistry. The department as a whole has a reputation for high-quality teaching.

b. State Rationale

- **How does this program address state priorities as reflected in *Reaching Higher, Achieving More?***

  - This program addresses state priorities as reflected in the document *Reaching Higher*, *Achieving More* in the following ways:

    - It provides and promotes a degree map articulating a pathway for completion of the degree within four years.
    - It limits total credit requirements to 120.
    - It prioritizes high-quality instruction via quality faculty and staff.
    - It addresses the field of biochemistry/biotechnology which is important to Indiana's economy.

c. Evidence of Labor Market Need

i. National, State, or Regional Need

- **Is the program serving a national, state, or regional labor market need?**

  - Biochemists work in a variety of fields and for a variety of employers (see for example in Appendix 3, the document 'Exploring Careers in Biochemistry and Molecular Biology' published in 2015 by the American Society of Biochemistry and Molecular Biology (ASBMB)). Such fields include:

    - Medicine and Health: clinical research, medical devices, doctors
    - Drug manufacture and design: drug properties, application, development
    - Environmental science: testing, air, water, and waste management, bioremediation
    - Agriculture: crop production, herbicide/pesticide development
    - Forensic science: toxicology, DNA analysis, scientific instrumentation
    - Education: teachers, professors

    Such employers for someone with a B.S. degree in biochemistry include:

    - Laboratories and agencies of federal, state and local governments (analyzing samples of food, drugs, cosmetics, air, water, wastes)
    - Laboratories in drug companies and biotechnology firms (working on drug development and quality control, clinical research and manufacturing/production)
    - Forensic laboratories (DNA fingerprinting)
    - Middle and high schools (teaching molecular life science courses)

  - The proposed program serves a national, state and regional labor market need. According to the US Department of Labor (see Appendix 2), there is a projected national increase by 8.0% in employment of biochemists and biophysicists in the 2014-2024 period. According to the Indiana Department of Workforce Development (see Appendix 2, Hoosiers by the Numbers), the projection is a 10.7% increase in state employment by 2024. In addition, the document "Hoosier Hot 50 jobs" published in 2014 (see Appendix 2) by the Indiana Department of Workforce

Development, listed a number of occupations, which can be pursued with a B.S. degree in biochemistry (followed by earning a degree, if necessary, from a professional or graduate school):

Occupation	Position in top 50 Statewide	Position in top 50 Region 3 (including Fort Wayne)
Physician and Surgeons		12
Pharmacist	16	24
Family Physician	17	
Physical Therapist	23	27
Medical Scientist	48	

ii. Preparation for Graduate Programs or Other Benefits

- **Does the program prepare students for graduate programs or provide other benefits to students besides preparation for entry into the labor market?**

  - The proposed program prepares students for pursuit of an M.S. or Ph.D. degree in graduate programs in biochemistry or entry into the labor market (job opportunities indicated above). According to the U.S. Bureau of Labor Statistics, biochemists and biophysicists need a Ph.D. degree to work in independent research and development. Bachelor's and Master's degree holders qualify for some entry-level positions in biochemistry and biophysics.

  - Additionally, the degree program is beneficial in providing students the opportunities to develop and enhance their skills in analytical work, communication, critical-thinking, mathematics and problem-solving.

iii. Summary of Indiana DWD and/or U.S. Department of Labor Data

- **Summarize the evidence of labor market demand for graduates of the program as gleaned from employment projections made by the Indiana Department of Workforce Development and/or the U.S. Department of Labor.**

  - According to the Indiana Department of Workforce Development, for Biochemists & Biophysicists, there is a projected growth of 10.7% in long term occupational employment through 2024.

  - According to the U.S. Department of Labor, for Biochemists & Biophysicists, the projected growth is 8.0% between 2014 and 2024. Specifically, the following are noteworthy:

Occupational area	Percent increase
Biomedical Engineer	23.1%
Medical Assistants	23.5%
Medical and Clinical Lab Technicians	17.8%

iv. National, State, or Regional Studies

- **Summarize any national, state, or regional studies that address the labor market need for the program. (For supporting data see Appendix 3)**

- According to the U.S. Bureau of Labor Statistics, the projected growth of 8% from 2014 to 2024 is as fast as the average for all occupations. In addition, more biochemists and biophysicists will be needed to develop biological processes and products using knowledge gained from basic research.

v. Surveys of Employers or Students and Analyses of Job Postings

- **Summarize the results of any surveys of employers or students and analyses of job postings relevant to the program. (Supporting data provided in Appendix 4)**

  - Two job web sites were investigated for recent job postings in the state of Indiana. The web sites can be found in Appendix 4.

    - For one, 74 job postings were found for a search of biotechnology jobs.
    - For the other, 69 postings were found for a similar search.

  - The most recent report (January 2012) by Biocrossroads, an Indianapolis-based company whose mission is to serve as a catalyst for the state's life-science industry, gives the status of the medical device industry in Indiana. See Appendix 4 for the report, which is entitled 'From Hearts to Hips: Indiana's Leadership in Medical Devices' and which indicates the following:

    - Indiana is a leader in medical device-related employment, with such major companies as Boston Scientific, Cook Medical, DePuy, Medtronic, Roche Diagnostics, and Zimmer having major operations in the state. According to a 2010 study, Indiana held the fifth highest percentage of medical-technology industry jobs of the 50 states; in addition, it is over two times the national average more specialized in medical devices. Warsaw remains the world-wide hub of the orthopedic industry.

    - The medical device sector is the largest component of the state's life sciences industry; more than 20,000 employees in this sector account for over 40 percent of all life sciences jobs. Furthermore, each medical technology job generates an additional 1.5 jobs within the state, each medical technology payroll dollar generates an additional 90 cents in earnings within the state, and each dollar of medical technology sales generates an additional 90 cents in sales activity. It is estimated that in Indiana the over 20,000 medical device jobs result in an additional 28,800 jobs, for a total employment impact of about 50,000 jobs related to the medical device sector.

  - According to the 2016 report 'Indiana's Health and Life Sciences Talent and Workforce: Developing Strategies to Compete in a Global Economy' prepared by TEConomy Partners, LLC (see Appendix 4), the "growing health and life sciences industry in Indiana is generating significant high quality job opportunities across a range of skill levels." There has been a 22% job growth in this industry since 2001 and it currently accounts for just over 1 in every 10 jobs in Indiana. A 15% increase in overall health and life sciences jobs is projected.

  - We have conducted a survey of spring 2016 chemistry students in the freshman chemistry courses CHM 11500 and CHM 11600: 'Would you be interested in a 4-year Biochemistry degree program offered by the Chemistry department at IPFW? Note

that this degree, compared to the B.S. Chemistry degrees, would include lower-level Math courses, but more Biology and Biochemistry courses.'

Total Number of Respondents	Yes	No
132	43	89

- With regards to surveys of employers, the following table presents Indiana's 24 Largest Medical Device Companies (by employment numbers); of these 13 reside in the northern or northeastern part of the state (marked with **).

Company	City
Advantis Medical	Greenwood
American Renolit	La Porte
AO Safety**	Plymouth
Beckman Coulter	Indianapolis
Boston Scientific	Spencer
C&A Tool Engineering**	Churubusco
Cook Group	Bloomington
DePuy**	Warsaw
EHOB	Indianapolis
Fort Wayne Metals**	Fort Wayne
Helmer	Noblesville
Heraeus Kulzer**	South Bend
Hologic	Indianapolis
King Systems	Noblesville
Medtronic**	Warsaw
Micropulse**	Columbia City
Paragon Medical**	Pierceton
Point Medical**	Crown Point
Quadrant**	Fort Wayne
Roche Diagnostics	Indianapolis
Smiths Medical	Gary
Symmetry Medical**	Warsaw
TP Orthodontics**	Westville
Zimmer Biomet**	Warsaw

- We proceeded to send a survey to the 13 companies marked with a ** above. We received responses from six which are included in Appendix 4. As can be seen from the returned surveys, all companies are supportive of the proposed B.S. Biochemistry degree and all think the degree program would contribute positively to the economic development of the region. Five of the six think it would be contribute positively to the technological development of the region (one company did not respond with a 'yes' or 'no'.)

vi. Letters of support

- **Summarize, by source, the letters received in support of the program. (Supporting date provided in Appendix 5)**

  - Letters of support were obtained from the following sources:

- Robert Ronk, Vice President Research, Zimmer Biomet
- Daniel Auger, Distinguished Engineering Fellow, DePuy Synthes
- Peter Kennelly, Chair, Education & Professional Development Committee, American Society of Biochemistry and Molecular Biology (ASBMB)

- The full letters are provided in Appendix 5. It is very encouraging that we have support of the proposal from two of the main medical device companies (DePuy and Zimmer Biomet) as well as from the organization from which we will seek accreditation (ASBMB).

- Also in Appendix 5 are letters of support from the chairpersons of two Chemistry departments in Indiana which offer degrees in biochemistry. These letters are also supportive of our proposal.

3. <u>Cost of and Support for the Program</u>

a. Costs

i. Faculty and Staff

- **Of the faculty and staff required to offer this program, how many are in place now and how many will need to be added (express both in terms of number of full- and part-time faculty and staff, as well as FTE faculty and staff)?**

  - No additional staff nor clerical positions need to be added to offer this program.

  - Appendix 6 lists the faculty (all Ph.D.) who will teach in the proposed degree program. The proposed program will require the offering of four courses new to the department: CHM 37200 (4 credit lecture; physical chemistry); CHM 33300 (3 credit lecture; biochemistry); CHM 53800 (3 credit lecture; biotechnology) and CHM 33500 (1 credit lab; biochemistry). This will introduce a total of 12 new contact hours of faculty teaching (a one credit lab, 3 hours/week, counts as two contact hours towards FTE). Therefore, we will need to find the equivalent of six limited term lecturers (LTL) to cover 100-level labs during the academic year to allow faculty 12 contact hours to be applied to this degree program. Funds will therefore be required for LTL positions. A total of twelve contact hours during the academic year equates to 0.5 FTE. The department is optimistic that LTLs can be found to satisfy the teaching requirement. If unable to find LTL's, the department could also request a Continuing Lecturer position wherein one individual could cover the above course load as well as some of the courses covered by existing LTL's.

ii. Facilities

- **Summarize any impact offering this program will have on renovations of existing facilities, requests for new capital projects (including reference to the institution's capital plan), or the leasing of new space.**

  - Adequate facilities exist.

iii. Other Capital Costs (e.g. Equipment)

- **Summarize any impact offering this program will have on other capital costs, including purchase of equipment needed for the program. (Appendix 8)**

  - The following equipment will need to be purchased to support this proposed program:

    - Agarose Gel Electrophoresis 4 units: $600 each
    - Blue Digital Bioimaging System 1 unit: $800 each

b. Support

i. Nature of Support (New, Existing, or Reallocated)

- **Summarize what reallocation of resources has taken place to support this program.**

  - The following table provides the number of chemistry degrees awarded in the period from 2010 – 2016 at IPFW.

Degree	Number
ACS-certified B.S.C.	12
ACS-certified B.S.C. biochemistry	25
B.S.	30
B.S. pre-medical	2
B.S. pre-dental	0
B.S. Chem teaching	2
TOTAL	71
Research certificate	2

  - As can be seen from the above table, the number of B.S. pre-med and pre-dent degrees offered in the past seven years is quite low. The proposed B.S. Biochemistry degree can, in fact, incorporate all of the B.S. pre-med majors since all the course requirements for admission into medical school are satisfied by the curriculum of the proposed B.S. biochemistry degree (with the caveat that students also take PSY 120 and SOC S161 courses needed for the Medical College Admission Test). The proposed B.S. Biochemistry degree can also incorporate the B.S. pre-dent majors if the latter take additional courses in anatomy and physiology. We, therefore, propose to eliminate both the B.S. pre-med and pre-dent degrees.

- **What programs, if any, have been eliminated or downsized in order to provide resources for this program?**

  - As discussed above, we would eliminate both the B.S. pre-med and pre-dent degrees. In addition, we would eliminate the ACS-certified BSC Biochemistry as a degree option because we anticipate that chemistry majors will prefer the proposed B.S. Biochemistry degree over the ACS degree option.

ii. Special Fees above Baseline Tuition

- **Summarize any special fees above baseline tuition that are needed to support this program.**

  - There are no special fees above baseline tuition that are needed to support this proposed program.

4. Similar and Related Programs

a. List of Programs and Degrees Conferred

i. Similar Programs at Other Institutions

- **Campuses offering (on-campus or distance education) programs that are similar:**

  - The following campuses in the state of Indiana offer B.S. Biochemistry degrees:

    - Anderson University
    - Ball State University
    - Bethel College
    - DePaul University
    - Earlham College
    - Indiana University Bloomington
    - Indiana University East
    - Indiana University Kokomo
    - Indiana University South Bend
    - Indiana Wesleyan University
    - Purdue University West Lafayette
    - Rose-Hulman Institute of Technology
    - University of Notre Dame
    - University of Evansville
    - University of Southern Indiana
    - Valparaiso University
    - Wabash College

  - Of the above schools, only the B.S. degree in Biochemistry at Purdue University West Lafayette is certified by the American Society of Biochemistry and Molecular Biology (ASBMB) and that degree program is housed in the Department of Biochemistry.

  Note: CHE Appendix A: CHE staff will summarize data from the Commission's Program Review Database.

ii. Related Programs at the Proposing Institution

- There is an existing degree option available at IPFW certified by the American Chemical Society (ACS) and considered a B.S. in Chemistry with biochemistry option. If this B.S. Biochemistry proposal is approved, we will eliminate the ACS certified Biochemistry degree.

- The increased emphasis on biology and biochemistry courses and fewer number of advanced mathematics and physics courses would likely be one of the primary reasons that the B.S. Biochemistry degree would attract students to this proposed degree in the Department of Chemistry. Note, however, that the levels of the mathematics and physics courses required in the proposed degree (which also now would include a statistics course) do provide sufficient preparation for students entering a biochemistry-related field and do meet the certification guidelines of the American Society of Biochemistry and Molecular Biology.

  Note: CHE Appendix B: CHE staff will summarize data from the Commission's Program Review Database.

b. List of Similar Programs Outside Indiana

- **If relevant, institutions outside Indiana (in contiguous states, MHEC states, or the nation, depending upon the nature of the proposed program) offering (on-campus or distance education) programs that are similar:**

  - The table below lists the 38 institutions which currently have B.S. Biochemistry degree

programs that are certified by the American Society of Biochemistry and Molecular Biology (ASBMB); also indicated are the departments where the degree is housed and if the institution is in an MHEC state.

Institution	State	Department where housed	MHEC
Bloomsburg University of Pennsylvania	PA	Department of Chemistry & Biochemistry	
Brigham Young University	UT	Department of Chemistry & Biochemistry	
California State University, Long Beach	CA	Department of Chemistry & Biochemistry	
Colby College	ME	Department of Chemistry	
Goucher College	MD	Department of Chemistry & Molecular Biology	
Hampden-Sydney College	VA	Department of Chemistry	
Hendrix College	AR	Department of Biology	
Hope College	MI	Department of Biology & Chemistry (jointly)	Yes
Miami University	OH	Department of Chemistry & Biochemistry	Yes
Middle Tennessee State University	TN	Department of Chemistry	
Minnesota State University, Mankato	MN	Department of Chemistry & Geology	Yes
Northeastern University	MA	Department of Biology & Chemistry & Chemical Biology (jointly)	Yes
Oregon State University	OR	Department of Biochemistry & Biophysics	
Otterbein University	OH	Department of Biology & Earth Science & Department of Chemistry (jointly)	Yes
Pennsylvania State University	PA	Department of Biochemistry & Molecular Biology	
Purdue University	IN	Department of Biochemistry	Yes
Roanoke College	VA	Department of Chemistry	
Rowan University	NJ	Department of Chemistry & Biochemistry	
San Francisco State University	CA	Department of Chemistry & Biochemistry	
South Dakota State University	SD	Department of Chemistry & Biochemistry	Yes
St. John's University	NY	Department of Chemistry	
Texas A&M	TX	Department of Biochemistry & Biophysics	
Texas State University	TX	Department of Chemistry & Biochemistry	
Tulane University	LA	Department of Chemistry & Department of Cell & Molecular Biology (jointly)	
University of Arizona	AZ	Department of Chemistry & Biochemistry	
University of California Davis	CA	Department of Molecular & Cellular Biology	
University of Minnesota, Twin Cities	MN	Department of Biochemistry, Molecular Biology & Biophysics	Yes
University of New Mexico	NM	Department of Biochemistry & Molecular Biology	
University Southern Mississippi	MS	Department of Chemistry & Biochemistry	
University of St. Joseph	CT	Department of Biochemistry	
University of Tampa	FL	Department of Chemistry	
University of the Sciences	PA	Department of Chemistry & Biochemistry	
Villanova University	PA	Department of Chemistry	
Virginia Tech	VA	Department of Biochemistry	
Wayne State University	MI	Department of Biochemistry & Molecular Biology	Yes
Wellesley College	MA	Department of Chemistry	
Willamette University	OR	Department of Chemistry	
Winthrop University	SC	Department of Chemistry, Physics, & Geology	

c. Articulation of Associate/Baccalaureate Programs

- **For each articulation agreement, indicate how many of the associate degree credits will transfer and apply toward the baccalaureate program.**

  - We have had conversations with Dr. Provi Mayo, chairperson of the Chemistry Department at Ivy Tech Fort Wayne. As seen in Appendix 9, a number of the courses (a total of 59 IPFW credits) which would be taken in the first two years of the proposed biochemistry degree program have equivalencies at the Ivy Tech Fort Wayne campus. (The Ivy Tech campus in West Lafayette offers courses in organic chemistry but not the Fort Wayne campus.)

  - Also, the Transfer Single Articulation Pathway (TSAP) being developed by chemistry faculty from across the state, based on learning outcomes rather than course equivalencies, should also make for seamless transfer from the Associate degree program to a Baccalaureate degree program.

d. Collaboration with Similar or Related Programs on Other Campuses

- **Indicate any collaborative arrangements in place to support the program.**

  - There are no collaborative arrangements currently in place but one nearby institution, the Manchester School of Pharmacy, has been contacted and conversations indicate that there are indeed opportunities for cooperative endeavors; these endeavors could include IPFW students performing research in laboratories of that institution. See Appendix 9 for a letter from Dr. Dennis Brown of the Manchester School of Pharmacy.

  - We also contacted Dr. Fen-Lei Chang, MD, Ph.D. Professor of Neurology, Associate Dean and Director, IU School of Medicine-Fort Wayne and conversations have been positive, indicating that, for example, undergraduate research at the IU School of Medicine is definitely possible. See Appendix 9 for a letter from Dr. Chang.

5. <u>Quality and Other Aspects of the Program</u>

a. Credit Hours Required/Time To Completion

- **Credit hours required for the program and how long a full-time student will need to complete the program.**

  - As seen in the degree plan in Appendix 10, the program consists of 120 required credit hours and can be completed in four years.

b. Exceeding the Standard Expectation of Credit Hours

- **If the associate or baccalaureate degree program exceeds 60 or 120 semester hours, respectively, summarize the reason for exceeding this standard expectation.**

  - The program does not exceed 120 semester credit hours.

c. Program Competencies or Learning Outcomes

- **List the significant competencies or learning outcomes that students completing this program are expected to master.**

    - The learning outcomes for the proposed B.S. in Biochemistry degree are listed and are explicitly tied to the six pillars of the IPFW Baccalaureate framework.

Framework Item	Learning Outcome
1. Acquisition of Knowledge:	The student will demonstrate knowledge and skills necessary for the biochemistry profession.
2. Application of Knowledge:	The student will use their biochemistry knowledge to make sound decisions and solve problems in their discipline while demonstrating skills for life-long learning.
3. Personal and Professional Values:	The student will exhibit high levels of personal integrity and professional ethics in their undergraduate careers.
4. A Sense of Community:	The student will demonstrate skills and knowledge needed to be responsible and productive in various community settings.
5. Critical Thinking and Problem Solving:	The student will demonstrate critical thinking skills through both qualitative and quantitative problem solving.
6. Communication:	The student will demonstrate effective oral and written communication of biochemical principles.

The American Society of Biochemistry and Molecular Biology (ASBMB) gives a very detailed list of learning outcomes for ASBMB-certified degree programs which can be found on the website http://www.asbmb.org/education/teachingstrategies/foundationalconcepts/. The courses in this degree proposal provide the necessary curriculum for students to meet the learning outcomes upon completion of the degree program.

d. Assessment

- **Summarize how the institution intends to assess students with respect to mastery of program competencies or learning outcomes.**

    - The following will be used as tools to assess students with respect to mastery of the above learning outcomes.

        - If the proposed degree program is approved, we will proceed to submit for certification by the American Society of Biochemistry and Molecular Biology (ASBMB). If certification is obtained, the students, at the end of their undergraduate career, will take the ASBMB degree certification examination. We have a goal that at least ninety percent of the students will pass the ASBMB assessment examination based on rubrics pre-established by the ASBMB.
        - The students will also take, as appropriate, American Chemical Society (ACS) standardized examinations during their undergraduate career. Scores will be compared to the ACS norms.
        - The students will take the ACS Diagnostic of Undergraduate Chemistry Knowledge (DUCK) examination in their final semester and scores will be compared to ACS norms.
        - Assessment results will be analyzed to evaluate the program and areas of improvement.

e. Licensure and Certification

Graduates of this program will be prepared to earn the following:

- **State License:**
  - None
- **National Professional Certifications (including the bodies issuing the certification):**
  - If the proposed degree program is approved, the IPFW Department of Chemistry will submit an application to the American Society of Biochemistry and Molecular Biology so that IPFW can become an ASBMB-accredited school. Once a program has been approved, its students become eligible for an ASBMB-certified degree. To qualify for degree certification, students must be in their last year of their biochemistry degree program and must pass an ASBMB assessment instrument. The latter exams are obtained from the ASBMB and administered by the university department. (See Appendix 5 for the ASBMB support letter.)
- **Third-Party Industry Certifications (including the bodies issuing the certification):**
  - None.

f. Placement of Graduates

- **Please describe the principle occupations and industries, in which the majority of graduates are expected to find employment.**
  - The principal industries of employment are listed above (Section 2.c.i) and reproduced here:
    - Medicine and Health: clinical research, medical devices, doctors
    - Drug manufacture and design: drug properties, application, development
    - Environmental science: testing, air, water, and waste management, bioremediation
    - Agriculture: crop production, herbicide/pesticide development
    - Forensic science: toxicology, DNA analysis, scientific instrumentation
    - Education: teachers, professors
- **If the program is primarily a feeder for graduate programs, please describe the principle kinds of graduate programs, in which the majority of graduates are expected to be admitted.**
  - Graduates of this program could also apply to graduate programs (both Masters and Doctoral programs) in biochemistry or, more generally, in chemistry. Such in-state programs include:

Ball State University:	MS in Chemistry
Indiana University Bloomington:	MS and Ph.D. in Chemistry; MS and Ph.D. in Biochemistry
IUPUI:	MS and Ph.D. in Chemistry; MS and Ph.D. in Biochemistry
Purdue University West Lafayette:	MS and Ph.D. in Chemistry; MS and Ph.D. in Biochemistry
Rose-Hulman Institute of Technology:	MS in Chemistry
University of Notre Dame:	Ph.D. in Biochemistry; Ph.D. in Chemistry

g. Accreditation

- **Accrediting body from which accreditation will be sought and the timetable for achieving accreditation.**

  - Accreditation from the American Society of Biochemistry and Molecular Biology (ASBMB) will be sought. If the proposed degree is approved by ICHE, an application for ASBMB accreditation will be submitted within one year of approval.

- **Reason for seeking accreditation.**

  - The reasons for seeking accreditation are:

    - It gives the department the opportunity to have its degree certified by one of the country's premier biochemistry and molecular biology societies.
    - It shows that our students have the tools needed to be successful and should help in students obtaining jobs or getting into graduate or professional school.
    - As the discipline of biochemistry is changing, this degree certification demonstrates that students' experiences are relevant.

6. <u>Projected Headcount and FTE Enrollment and Degrees Conferred</u>

- **Report headcount and FTE enrollment and degrees conferred data in a manner consistent with the Commission's Student Information System.**

  - See the spreadsheet following the appendices for projected headcount. The headcounts are based somewhat on the experiences of other Indiana universities which offer such a degree. Also note that we can indicate graduates of this degree program in the second year the degree is offered; this is possible because a chemistry major of junior status, who previously had declared a B.S. Chemistry major, could take in his/her junior and senior years the additional courses needed for the B.S. Biochemistry degree and thus graduate with this baccalaureate degree.

- **Report a table for each campus or off-campus location at which the program will be offered.**

  - All B.S. Biochemistry courses will be delivered on the IPFW campus.

- **If the program is offered at more than one campus or off-campus location, a summary table, which reports the total headcount and FTE enrollments and degrees conferred across all locations, should be provided.**

  - Not applicable.

- **Round the FTE enrollments to the nearest whole number**.

  - See the spreadsheet mentioned above (following the appendices) where entries are reported to nearest whole number.

- **If the program will take more than five years to be fully implemented and to reach steady state, report additional years of projections**.
    - Not applicable.

* Please consult the library resource questionnaire found below which addresses the questions raised in http://www.ipfw.edu/offices/oaa/programs/curriculumdev.html

When developing a new degree program, certificate, minor, or concentration, please review the questions below when developing your response to the library or additional resources sections. Please consult your liaison librarian for assistance.

Library Resources

Address the following issues regarding the impact of the new program on the library's budget and personnel. Please respond to each item below indicating the library sources and services required to support the proposed program.

- **Which databases/indexing sources will be used by the courses in this program?**
  Freely available databases such as Protein Database viewer, PubMed, Royal Society of Chemistry Protein Database and Scopus will be used. SciFinder Scholar is also needed.
- **What are the journals that will be used by students completing library research in this program? Please list three to five titles. Is there an expectation that access to new journals will need to be purchased for students in this program?**
  PLOS (Public Library of Science) One, Nature Chemical Biology, ACS Chemical Biology, Journal of Molecular Biology, Biochemistry. We do not anticipate the need at this time to access new journals that will need to be purchased.
- **Are there any specific reference sources (e.g. encyclopedias, handbooks, standards, etc.) required to support the new program?**
  We do not anticipate this need at this time.
- **Is there an expectation for additional books to be purchased? What about DVD or audio/visual materials? What is the estimated dollar amount needed yearly to support this program with new books and media materials?**
  At this time there will not be any new materials required.
- **Will the new program use the Library's Document Delivery Services? Costs for this service come out of the Library's budget. What types of materials would the program be requesting through DDS?**
  We may request 2-3 articles from the above journals per semester.
- **Who is the liaison librarian for this program? The liaison librarian provides support through involvement in Blackboard-supported classes, one-on-one research consultations, in-class instructional sessions, and tailored course guides for research assignments. Which of these librarian services do you anticipate will be utilized in the new program?**
  David Dunham is the liaison for Chemistry. We do not anticipate using the above-mentioned resources at this time.
- **Is there an accrediting body that will be overseeing this program? What are the statements of the accrediting body related to the library, e.g. holdings, personnel, services?**
  We anticipate seeking accreditation from the American Society of Biochemistry and Molecular Biology (ASBMB). There are no direct statements about specific library services. Other potential activities include preparing research proposals or grant applications, writing intensive projects, constructing or contributing to web pages or blogs, etc. Some of the latter may require library services.

6. Project Headcount and FTE Enrollments and Degrees Conferred						
Date, 2018						
Institution/Location: IPFW						
Program: B.S. Biochemistry						
	Year 1	Year 2	Year 3	Year 4	Year 5	
	FY2018	FY2019	FY2020	FY2021	FY2022	
Enrollment Projections (Headcount)						
Full-Time	6	10	14	18	22	
Part-Time	2	4	6	8	10	
Total	8	14	20	26	32	
Enrollment Projections (FTE)						
Full-Time	6	10	14	18	22	
Part-Time	1	2	3	4	5	
Total	7	12	17	22	27	
Degrees Conferred Projections	0	2	4	6	8	
CHE Code:12-XX						
Campus Code: XXXX						
County: XXXX						
Degree Level: XXX						
CIP Code: Federal - 26.0202; State - 000000						

- IPFW Plan 2020:
  - https://www.ipfw.edu/dotAsset/d4a43e12-69e1-4101-bc43-3684c0af4324.pdf

- USAP 2nd Year Report:
  - https://www.ipfw.edu/microsites/usap/Document_Library/documents/year-2-documents/IPFW%20USAP%20Report%20and%20Recommendations%20FY16%20v02.pdf

- Hoosiers by the Number:
  - Long Term Occupational Projections: Indiana in 2022 – Life Science: http://www.hoosierdata.in.gov/dpage.asp?id=39&view_number=2&menu_level=&panel_number=2
  - Occupational Projections Short Term – All Occupations: http://www.hoosierdata.in.gov/dpage.asp?id=66&view_number=2&menu_level=&panel_number=2

- Indiana Department of Workforce Development
  - https://netsolutions.dwd.in.gov/hh50/jobList.aspx (Statewide)
  - https://netsolutions.dwd.in.gov/hh50/downloads/regions/2014_RegionalHot50_REGION3.pdf (Region 3 including Fort Wayne)
  - https://netsolutions.dwd.in.gov/hh50/About.aspx (About)

- U.S Department of Labor:
  - Occupational Outlook Handbook – Biochemists and Biophysicists: http://www.bls.gov/ooh/life-physical-and-social-science/biochemists-and-biophysicists.htm
  - Occupational Employment and Wages, May 2015: http://www.bls.gov/oes/current/oes191021.htm
  - Employment Projections : http://data.bls.gov/projections/occupationProj

- American Society of Biochemistry and Molecular Biology (ASBMB):
    - 2015 Career File: www.asbmb.org/uploadedFiles/Careers/Resources/ASBMB%20Career%20Brochure%202015%20Final.pdf

- Biocrossroads:
  - BioIntellex.com Indiana Medical Devices, 2012: www.biointellex.com/wp-content/uploads/2014/08/2012-Indiana-Medical-Devices-Report.pdf

- TEConomy Partners, LLC:
  - www.biointellex.com/wp-content/uploads/2016/05/IndianaLifeWorkForceStudy-final.pdf

- Job posting websites:
  - http://www.onetonline.org/link/jobs/19-1021.00?j=1&st=IN&g=Go
  - http://beta.careerbuilder.com/?siteid=cbnsv

- Industry Survey Response Letters (following pages):
  - Paragon Medical
  - Fort Wayne Metals
  - C&A Tool Engineering
  - Micropulse
  - Zimmer Biomet
  - Depuy Orthopaedics, Inc.

DEPARTMENT OF CHEMISTRY
INDIANA UNIVERSITY–PURDUE UNIVERSITY FORT WAYNE
COLLEGE OF ARTS AND SCIENCES

Paragon Medical
8 Matchett Drive
Pierceton, IN 46562

To whom it may concern,

My name is Ron Friedman and I am the chairperson of the Chemistry Department at Indiana Purdue Fort Wayne. Our department is in the process of developing a B.S. Biochemistry degree; as part of the degree proposal, we are required to survey industries in the region to inquire about support for the proposed degree.

We request that you please pass this letter on to an individual in your company who can complete the form below and return in the enclosed envelope.

Thank you for your attention.
Best wishes,

Ronald S. Friedman

Ron Friedman
Professor and Chairperson of IPFW Chemistry

1. Would you be supportive of a 4-year BS Biochemistry within the Chemistry Department at Indiana Purdue Fort Wayne?

   Yes ✓ No _____

2. Do you think this degree program would contribute positively to the economic develop of the region?

   Yes ✓ No _____

3. Do you think this degree program would contribute positively to the technological development of the region?

   Yes ✓ No _____

BEN STEVEN	Ben	01-28-16
Printed name	Signed name	Date

Human Resources
Title

SCIENCE BUILDING, ROOM 496, 2101 EAST COLISEUM BOULEVARD, FORT WAYNE, INDIANA 46805-1499
p: 260-481-6289 ▼ f: 260-481-6070 ▼ ipfw.edu/chemistry

DEPARTMENT OF CHEMISTRY
INDIANA UNIVERSITY–PURDUE UNIVERSITY FORT WAYNE
COLLEGE OF ARTS AND SCIENCES

Fort Wayne Metals
9609 Ardmore Ave
Fort Wayne, IN 46809

To whom it may concern,

My name is Ron Friedman and I am the chairperson of the Chemistry Department at Indiana Purdue Fort Wayne. Our department is in the process of developing a B.S. Biochemistry degree; as part of the degree proposal, we are required to survey industries in the region to inquire about support for the proposed degree

We request that you please pass this letter on to an individual in your company who can complete the form below and return in the enclosed envelope.

Thank you for your attention.
Best wishes,

Ronald S. Friedman

Ron Friedman
Professor and Chairperson of IPFW Chemistry

1. Would you be supportive of a 4-year BS Biochemistry within the Chemistry Department at Indiana Purdue Fort Wayne?

   Yes ✓ No _____

2. Do you think this degree program would contribute positively to the economic develop of the region?

   Yes ✓ No _____

3. Do you think this degree program would contribute positively to the technological development of the region?

   Yes ✓ No _____

LAWRENCE E. KAY — Lawrence E Kay — 29 JAN 2016
Printed name — Signed name — Date

DIRECTOR OF TECHNOLOGY, FORT WAYNE METALS RESEARCH TECHNOLOGY
Title

SCIENCE BUILDING, ROOM 496, 2101 EAST COLISEUM BOULEVARD, FORT WAYNE, INDIANA 46805-1499
p: 260-481-6289 ▼ f: 260-481-6070 ▼ ipfw.edu/chemistry

IPFW
DEPARTMENT OF CHEMISTRY
INDIANA UNIVERSITY–PURDUE UNIVERSITY FORT WAYNE
COLLEGE OF ARTS AND SCIENCES

C&A Tool Engineering
4100 US-33
Churubusco, IN 46723

To whom it may concern,

My name is Ron Friedman and I am the chairperson of the Chemistry Department at Indiana Purdue Fort Wayne. Our department is in the process of developing a B.S. Biochemistry degree; as part of the degree proposal, we are required to survey industries in the region to inquire about support for the proposed degree.

We request that you please pass this letter on to an individual in your company who can complete the form below and return in the enclosed envelope.

Thank you for your attention.
Best wishes,

Ronald S. Friedman

Ron Friedman
Professor and Chairperson of IPFW Chemistry

1. Would you be supportive of a 4-year BS Biochemistry within the Chemistry Department at Indiana Purdue Fort Wayne?

   Yes ___X___ No ________

2. Do you think this degree program would contribute positively to the economic develop of the region?

   Yes ___X___ No ________

3. Do you think this degree program would contribute positively to the technological development of the region?

   Yes ________ ? No ________

Rob Marx ________ Rob Marx ________ 1-26-16
Printed name Signed name Date

V.P.
Title

SCIENCE BUILDING, ROOM 496, 2101 EAST COLISEUM BOULEVARD, FORT WAYNE, INDIANA 46805-1499
p: 260-481-6289 ▾ f: 260-481-6070 ▾ ipfw.edu/chemistry

DEPARTMENT OF CHEMISTRY
INDIANA UNIVERSITY–PURDUE UNIVERSITY FORT WAYNE
COLLEGE OF ARTS AND SCIENCES

Micropulse
5865 East State Road 14
Columbia City, IN 46725

To whom it may concern,

My name is Ron Friedman and I am the chairperson of the Chemistry Department at Indiana Purdue Fort Wayne. Our department is in the process of developing a B.S. Biochemistry degree; as part of the degree proposal, we are required to survey industries in the region to inquire about support for the proposed degree.

We request that you please pass this letter on to an individual in your company who can complete the form below and return in the enclosed envelope.

Thank you for your attention.
Best wishes,

Ronald S. Friedman

Ron Friedman
Professor and Chairperson of IPFW Chemistry

1. Would you be supportive of a 4-year BS Biochemistry within the Chemistry Department at Indiana Purdue Fort Wayne?

   Yes X No _____

2. Do you think this degree program would contribute positively to the economic develop of the region?

   Yes X No _____

3. Do you think this degree program would contribute positively to the technological development of the region?

   Yes X No _____

Brian Emerick Brian Emerick 01-27-2016
Printed name Signed name Date

President & CEO.
Title

SCIENCE BUILDING, ROOM 496, 2101 EAST COLISEUM BOULEVARD, FORT WAYNE, INDIANA 46805-1499
p: 260-481-6289 ▾ f: 260-481-6070 ▾ ipfw.edu/chemistry

DEPARTMENT OF CHEMISTRY
INDIANA UNIVERSITY–PURDUE UNIVERSITY FORT WAYNE
COLLEGE OF ARTS AND SCIENCES

Robert M. Ronk
Vice President, Research
Zimmer Biomet
1800 W. Center Street
Warsaw, IN 46580

Dear Robert,

My name is Ron Friedman and I am the chairperson of the Chemistry Department at Indiana Purdue Fort Wayne. Our department is in the process of developing a B.S. Biochemistry degree; as part of the degree proposal, we are required to survey industries in the region to inquire about support for the proposed degree.

We request that you please pass this letter on to an individual in your company who can complete the form below and return in the enclosed envelope.

Thank you for your attention.
Best wishes,

Ronald S. Friedman

Ron Friedman
Professor and Chairperson of IPFW Chemistry

1. Would you be supportive of a 4-year BS Biochemistry within the Chemistry Department at Indiana Purdue Fort Wayne?

   Yes ✓ No _____

2. Do you think this degree program would contribute positively to the economic develop of the region?

   Yes ✓ No _____

3. Do you think this degree program would contribute positively to the technological development of the region?

   Yes ✓ No _____

ROBERT RONK — 2/22/2016
Printed name — Signed name — Date

VICE PRESIDENT, RESEARCH
Title

SCIENCE BUILDING, ROOM 496, 2101 EAST COLISEUM BOULEVARD, FORT WAYNE, INDIANA 46805-1499
p: 260-481-6289 ▾ f: 260-481-6070 ▾ ipfw.edu/chemistry

DEPARTMENT OF CHEMISTRY
INDIANA UNIVERSITY–PURDUE UNIVERSITY FORT WAYNE
COLLEGE OF ARTS AND SCIENCES

Daniel Auger
Distinguished Engineering Fellow
Depuy Orthopaedics, Inc.
700 Orthopaedic Drive
Warsaw, IN 46582

Dear Daniel,

My name is Ron Friedman and I am the chairperson of the Chemistry Department at Indiana Purdue Fort Wayne. Our department is in the process of developing a B.S. Biochemistry degree; as part of the degree proposal, we are required to survey industries in the region to inquire about support for the proposed degree.

We request that you please pass this letter on to an individual in your company who can complete the form below and return in the enclosed envelope.

Thank you for your attention.
Best wishes,

Ronald S. Friedman

Ron Friedman
Professor and Chairperson of IPFW Chemistry

1. Would you be supportive of a 4-year BS Biochemistry within the Chemistry Department at Indiana Purdue Fort Wayne?

   Yes ✓ No _____

2. Do you think this degree program would contribute positively to the economic develop of the region?

   Yes ✓ No _____

3. Do you think this degree program would contribute positively to the technological development of the region?

   Yes ✓ No _____

DANIEL D. AUGER | Daniel D. Auger | 19 Feb 2016
Printed name | Signed name | Date

DISTINGUISHED ENGINEERING FELLOW
Title

SCIENCE BUILDING, ROOM 496, 2101 EAST COLISEUM BOULEVARD, FORT WAYNE, INDIANA 46805-1499
p: 260-481-6289 ▾ f: 260-481-6070 ▾ ipfw.edu/chemistry

Appendix 5: Letters of Support, Detail

(Following pages to include the following letters)

- Daniel Auger, Distinguished Engineering Fellow, DePuy Synthes
- Robert Ronk, Vice President Research, Zimmer Biomet
- Peter Kennelly, Chair, Education & Professional Development Committee, American Society of Biochemistry and Molecular Biology (ASBMB)
- Christian Chauret, IU Kokomo
- Bill Feighery, IU South Bend

DePuy Synthes *People inspired*
JOINT RECONSTRUCTION
COMPANIES OF Johnson & Johnson

February 24, 2016

Dear Indiana Commission for Higher Education:

I would like to express my support of the proposed Baccalaureate degree in Biochemistry at Indiana University Purdue University in Fort Wayne (IPFW). As there are no universities in northeastern Indiana that offer such a degree, the proposal is a valuable addition to the educational opportunities for college students in the region.

Our company, DePuy Synthes, designs, develops and manufactures joint replacement implants. More broadly, our parent company, Johnson & Johnson, has interest in biochemistry expertise through our pharmaceutical and consumer divisions. With the increased advent of biomaterials in medicine, there is the potential need for more biochemistry majors in the future. Therefore, students with an expertise in biochemistry could make a valuable addition to the Johnson & Johnson workforce.

The curriculum for the proposed degree should prepare IPFW students with the skills and knowledge necessary to be successful in the pharmaceutical and sales divisions. The additional biochemistry and biology classes required for this degree (but not required for the current B.S. Chemistry degrees) are an important part of the curriculum.

I hope you will give serious consideration to the approval of the proposed B.S. Biochemistry at IPFW.

Sincerely,

Daniel Auger
Distinguished Engineering Fellow

DA/jp

PO Box 988
700 Orthopaedic Drive
Warsaw, IN 46581-0988
United States (USA)

T. +1 (574) 267-8143
F. +1 (574) 372-7128
depuysynthes.com

ZIMMER BIOMET
Your progress. Our promise.™

February 22, 2016

Indiana University Purdue University Fort Wayne (IPFW)
2101 East Coliseum Boulevard
Fort Wayne, Indiana 46897

Attention: Professor R S Friedman

Dear Indiana Commission for Higher Education:

I am writing in support of the proposed B.S. Biochemistry degree at Indiana University Purdue University Fort Wayne (IPFW). In the State of Indiana, there are only 17 universities, both private and public, which offer such a degree and of those, only 4 are in northern Indiana.

Our company, Zimmer Biomet, is a medical device company and historically our research has focused on biomechanics and material science. However, as technologies have evolved, the lines between materials, mechanics, biology, chemistry, etc. have blurred, and we find ourselves more and more in need of scientists/engineers with expertise in biology, chemistry and the life sciences. Combination devices that provide both a mechanical function and deliver active substances/surfaces to the surrounding tissue are finding their way into the medical device space, and need experts who can evaluate and develop those technologies. Therefore, as the field of biologics materials within medicine expands, the need for increasing numbers of biochemistry majors is potentially important.

IPFW currently offers a B.S. in Chemistry, but a student pursuing the proposed B.S. Biochemistry degree must take significantly more biology and biochemistry classes. Such coursework should provide graduates with the expertise and knowledge needed to be successful in the workforce.

I hope you will give serious consideration to the approval of the proposed B.S. Biochemistry at IPFW.

Sincerely,

Robert Ronk
Vice President Research
Zimmer Biomet, Inc.

Zimmer Biomet
1800 West Center Street, Warsaw, IN 46580
574.267.6131

ASBMB Suite 302
11200 Rockville Pike
Rockville, MD 20852
USA

American Society for Biochemistry and Molecular Biology

March 9, 2016

Ronald S. Friedman, Ph.D.
Professor and Chair
Department of Chemistry
Indiana University Purdue University Fort Wayne
Fort Wayne, Indiana 46805

Dear Prof. Friedman:

As chair of the Education & Professional Development Committee of the American Society for Biochemistry & Molecular Biology [ASBMB], it is my pleasure to support your department's proposal to institute a B.S. degree program in Biochemistry at IUPU Fort Wayne. ASBMB, the professional organization for some 12,000 biochemists and molecular biologists from America and across the globe, is committed to promoting high quality educational programs in Biochemistry, Molecular Biology, and related areas.

One of the vehicles the society is using to promote education excellent is our national accreditation program for bachelor's degrees in Biochemistry. Students matriculating at an ASBMB accredited institution are eligible to take our national examination in an effort to qualify for conferral of ASBMB certified degree. The goals of the ASBMB accreditation and degree certification program are to provide:

- a national, outcomes-based mechanism by which students receiving a B.S. or B.A. in Biochemistry & Molecular Biology or closely related major are given an opportunity to have their degree **certified** by The American Society for Biochemistry and Molecular Biology (ASBMB).
- a vehicle for **recognizing** undergraduate BMB programs whose features and infrastructure fulfill the basic expectations of the ASBMB.
- access to an independently constructed and scored instrument for assessing student achievement and program effectiveness.
-

Since we initiated the program in 2013, more than fifty colleges and universities, large and small and public and private, have successfully applied for accredited status, including:

Bloomsburg University	Colby College	Hope College
Miami of Ohio	Northeastern University	Otterbein University
Oregon State University	Penn State University	Purdue
Texas A&M University	University of Arizona	University of Minnesota
University of Virginia	Villanova University	Wellesley College

The number of students majoring in Biochemistry at our fifty-one member institutions ranges from a small handful to several hundred, with a high of ≈ 1100 at UC Davis. It is our hope that, if approved by Indiana's Higher Learning Commission, IUPU Ft. Wayne will consider submitting an application.

Tel: 240-283-6600 • Fax: 301-881-2080 • E-mail: asbmb@asbmb.org

ASBMB Suite 302
11200 Rockville Pike
Rockville, MD 20852
USA

American Society for Biochemistry and Molecular Biology

Over the past few decades Biochemistry has developed into one of the major driving forces of our 21st century economy. The vistas being opened by the stream of new insights being generated by cutting edge "–omic" and imaging technologies is projected to fuel the growth and impact of biochemistry for many decades to come. Students graduating with a B.S. degree in biochemistry thus can and should continue to find dynamic and well-paying jobs in pharmaceuticals, agrichemicals, agrigenetics, food and consumer products, food safety and biosecurity, environmental analysis and remediation, biotechnology, clinical analysis, green energy, bioinformatics and data mining, sales, marketing, investment, policy, forensics, publishing, etc. as well as in academics and research institutes.

Opportunities to pursue advanced study are plentiful for B.S. biochemists, not only in biochemistry and molecular biology, but in other related areas of the life sciences such neuroscience, microbiology, pharmacology, and cell biology. Demand is especially high for students who complement their knowledge of biochemistry with complementary training in business, law, statistics, computer science, engineering, etc. A B.S. degree in biochemistry also represents an ideal launching point for a career in medicine, where the new MCAT exam and admission policies place increased emphasis on a string foundation in biochemistry and metabolism.

The dynamism and opportunities of contemporary Biochemistry continues to draw increasing numbers of students to the field. For example, at my own home institution, Virginia Tech, the number of students majoring in Biochemistry has tripled to ≈ 700 over the last dozen years. Nationally, the number of students graduating with bachelor's degrees in Biochemistry is approaching that earning traditional Chemistry degrees, by a ratio of 3:5 (*Chemical & Engineering News* April 22, 2013).

An examination of the proposed curriculum for IUPU Ft. Wayne's proposed B.S. degree program in Biochemistry indicates a depth and rigor comparable to those of established programs at institutions such as Purdue University in West Lafayette. The proposed B.S. degree program in Biochemistry at IUPU Fort Wayne thus should address an area of both high student demand and continuing economic need.

Sincerely,

Peter J. Kennelly, Ph.D.
Chair, Education and Professional Development Committee
American Society for Biochemistry and Molecular Biology
pjkennel@vt.edu / (540) 231-4317

INDIANA UNIVERSITY
KOKOMO
SCHOOL OF SCIENCES

March 11, 2016

Dr. Ronald Friedman
Professor and Chair
Dept of Chemistry, IPFW

Dear Ronald,

It is with great pleasure that I write this letter in support of your biochemistry degree proposal. In my experience, it is a great addition to degree offerings in the natural sciences. Our biochemistry B.S. degree at IU Kokomo was initiated in 2012. The degree has grown and has yielded some interesting results. Overall, we have spent approximately $30,000 in equipment and supplies to get this program started (although a lot of equipment was already available because we offer other closely-related labs in molecular biology, microbiology, and organic chemistry).

To provide some background, the Fall 2015 enrollment at IU Kokomo was 3,944 undergraduate students, so we are a relatively small campus. In its first semester (Fall 2012), six students were enrolled as biochemistry majors. Since then, the enrollment in biochemistry has grown to 23 students (Fall 2015 census). We hired a biochemistry faculty in 2013 and she has developed two upper-level courses with labs in biochemistry (CHEM-C 329 5 cr, CHEM-C 340 5 cr). She is now in the process of developing a 200-level biochemistry class that would be a useful transition for sophomores/juniors. This biochemistry faculty also teaches some general chemistry classes, especially those required for nursing and allied health students (therefore, she helps with service courses). She has a very active research program and numerous undergraduates have now worked in her research lab. This faculty member emphasizes strong lab techniques in biochemistry and students are well versed not only in biochemistry, but also in molecular biology and organic chemistry. In fact, the biochemistry degree has a synergistic relationship with several areas of biology and chemistry. Besides biochemistry courses, students need to take classes in molecular biology, microbiology, immunology, organic chemistry, analytical chemistry, and physical chemistry. Most of those classes have a lab component.

Assessment is conducted in biochemistry, but given the fact that the program is still very young, these assessment data are limited at the moment. Nevertheless, we are very confident about the quality of our program and the value of our graduates. For example, the program graduated its first student in 2015. This individual currently works as an ER Technician for IU Health Arnett in Lafayette, IN. In 2016, we anticipate that four biochemistry majors will graduate. Two of those biochemistry majors have been accepted into PhD biochemistry programs at major Research I Universities, whereas a third one already works in the pharmaceutical field.

It should be noted that the introduction of the biochemistry degree has not negatively impacted enrollment in our biology degree (B.S./B.A.). We had 55 and 84 biology majors in Fall 2012 and Fall 2015, respectively. Meanwhile, the enrollment in our chemistry B.S. has remained steady. Therefore, I expect that as the biochemistry program continues to grow, it will increase the image of our school and have a positive impact on enrollment. Many students seem to be seeking this type of degree, especially those that are inclined to pursue a laboratory-intensive career path with options in both chemistry and biology.

Good luck with your proposal and do not hesitate to contact me if you need more information.

Christian Chauret, Ph.D.
Dean and Professor of Microbiology

2300 S. Washington Street P.O. Box 9003 Kokomo, IN 46904-9003 (765) 455-9371 fax (765) 455-9310

INDIANA UNIVERSITY SOUTH BEND

DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

March 11, 2016

Ronald Friedman
Professor and Chair
Department of Chemistry
Indiana University Purdue University Fort Wayne

Dear Dr. Friedman:

I am writing this letter in support of your Department's proposal to add a Biochemistry degree. We have been offering a BS in Biochemistry since 2006 and our experience with the degree has been excellent. The degree has grown each year and our biochemistry students have been very successful in their chosen career paths.

Our department here at IU South Bend is smaller than your department at IPFW, but to give you some perspective, in the last five years we have graduated 12 chemistry majors while in the same time period we have graduated 26 biochemistry majors. This trend is mirrored in the number of declared majors in each degree; this past Fall we had 21 chemistry majors and 36 biochemistry majors in our program. Again, for perspective, the number of degree seeking undergraduates enrolled at IU South Bend for Fall 2015 was just under 5,400. Our senior class this year is quite large for us – we are expecting 5 students to graduate in chemistry and 10 students graduate in biochemistry. As mentioned, our biochemistry students have been also been very successful; for example, of the 10 students who will graduate with a biochemistry degree this year, 3 have been accepted to medical school, 1 to optometry school, 2 to graduate programs in biochemistry, and 2 more are already working with the companies that will employ them after graduation.

The biochemistry degree has also proven to be invaluable to our department. In a time when the numbers of chemistry majors has been declining and our upper-level class sizes becoming problematic, the influx of biochemistry majors has helped to stabilize our overall enrollment. In addition, just this past year, we were able to hire a new faculty member in biochemistry, one of the very few new positions approved across campus. In short, the degree has added a new level of vibrancy to our department. It has been exciting to our faculty to be part of its growth and has provided our students with a valuable career option.

I wish you luck with your biochemistry degree proposal and trust that it will be as successful for you as ours has been for us. Please don't hesitate to contact me if you need any additional information.

Sincerely,

Bill Feighery
Professor and Chair

051 Northside Hall 1700 Mishawaka Ave South Bend, Indiana 46634-711 (574) 520-4311
wfeigher@iusb.edu

Appendix 6: Faculty and Staff, Detail

Name	Rank	Credentials	Courses will Teach
Friedman, Ronald	Professor & Chair	Ph.D., Harvard, 1989	Physical
Columbia, Michael	Associate Professor & Associate Chair	Ph.D., Iowa State, 1991	General Analytical
Jing, Peng	Assistant Professor	Ph.D., Kyushu University, Japan, 2003	Biochem
Qasim, Mohammad	Associate Professor	Ph.D., Aligarh M. University, India, 1978	Biochem
Tippmann, Eric	Assistant Professor	Ph.D., Ohio State University, 2003	Biochem Organic
Berger, Robert	Associate Professor	Ph.D., Purdue University, 1988	General Inorganic
Linn, Donald	Professor	Ph.D. University of Georgia, 1983	Inorganic Chem Literature
Maloney, Vincent	Associate Professor	Ph.D., Ohio State University, 1987	Organic
Stevenson, Steven	Associate Professor	Ph.D., Virginia Tech, 1995	General
Tahmassebi, Daryoush	Associate Professor	Ph.D., Tarbiat Modarres University, 1997	Organic

- Not applicable (Adequate facilities exist)

Appendix 8: Other Capital Costs, Detail

Capital Equipment:	**Number Needed:**	**Cost:**
Agarose Gel Electrophoresis	4 units	$600 each
Blue Digital Bioimaging System	1 unit	$800 each
	Grand Total:	$3200

- **Proposed B.S. Biochemistry degree: IPFW – Ivy Tech equivalencies (credits)**

IPFW course	Ivy Tech Fort Wayne course
CHM classes	
CHM 115 + 116 (8)	CHM 105 + 106 (10)
BIO classes	
BIO 117 + 119 (8)	BIO 105 + 106 (10)
PHYS classes	
PHYS 220 + 221 (8)	PHYS 101 + 102 (8)
ENG classes	
ENG W131 (3)	ENG 111 (3)
ENG W233 (3)	ENG 112 (3)
MA classes	
MA 154 (3)	MA 137 (3)
MA 229 (3)	MA 201 (3)
MA 230 (3)	MA 202 (3)
STAT 240/301 (3)	MA 200 (3) (not on IN Core Trans Lib; possible match)
Foreign language (example)	
SPAN 111 (4)	SPAN 101 (4)
SPAN 112 (4)	SPAN 102 (4)
Gen Ed classes	
COM 114 (3)	COMM 101 (3)
PSY 120 (3)	PSYC 101 (3)
SOC S161 (3)	SOCI 111 (3)

- Letters of Support (following)
    - Dr. Dennis Brown, Manchester School of Pharmacy
    - Dr. Fen-Lei Chang, IU School of Medicine – Fort Wayne

Manchester University
COLLEGE of PHARMACY, NATURAL & HEALTH SCIENCES

Fort Wayne Campus
10627 Diebold Road
Fort Wayne, 46845
T 260-470-2700
W pharmacy.manchester.edu

May 13th, 2016

Indiana University Purdue University Fort Wayne (IPFW)
2101 East Coliseum Boulevard
Fort Wayne, Indiana 46805

Attention: Professor R. S. Friedman

Dear Indiana Commission for Higher Education:

I am writing this letter in support of the biochemistry degree/concentration proposed by the chemistry department of IPFW. The offering of this new degree would foster additional opportunities for IPFW and the Pharmacy Program at Manchester University to interact. Biochemistry is an important science in the field of pharmacy, and such a degree from IPFW would prepare graduating students for entry into our Doctor of Pharmacy program.

In addition to establishing a stronger student pipeline with IPFW, a biochemistry degree would enhance faculty and student research at both institutions. The faculty in the Pharmacy Program at Manchester University conduct research in the major areas of pharmaceutical sciences, including medicinal chemistry, pharmacology, pharmaceutics, and toxicology. Theses disciplines nicely compliment biochemistry, and an active biochemistry program at IPFW would allow faculty and students from both universities to work together on research projects.

Please let me know if you have any questions.

Best regards,

Dennis Brown

Dennis Brown, PhD
Assistant Professor of Pharmaceutical Sciences
Manchester University Pharmacy Program
10627 Diebold Rd
Fort Wayne, IN 46845
(260) 470-2674
dabrown@manchester.edu

INDIANA UNIVERSITY
SCHOOL OF MEDICINE–FORT WAYNE
On the campus of Indiana University–Purdue University Fort Wayne

May 30, 2016

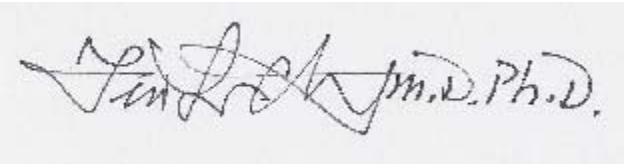
This is a letter to indicate my strong support of a BS program in Biochemistry at IPFW.

The offering of a BS Biochemistry degree would enhance opportunities for collaboration between IPFW Department of Chemistry and IUSM-Fort Wayne both in terms of faculty and also student interactions.

Undergraduate research at IUSM-Fort Wayne is readily available for BS Biochemistry students at IPFW. For medical students there will be enhanced diversity of research opportunities to work with faculty and students from the Biochemistry program throughout all four years of their medical education.

There are a number of IUSM-Fort Wayne faculty members conducting research in the area of biochemistry. We are looking forward to increased opportunity in research collaboration as well.

Sincerely,



Fen-Lei Chang, MD, PhD
Professor of Neurology
Associate Dean and Director
Indiana University School of Medicine-Fort Wayne
Medical Education Building
2101 E Coliseum Blvd
Fort Wayne, IN 46805
Office: 260-481-6730

4-Year Plan (Summer terms should only be used if you have courses that are only offered in the summer)

Academic Program: Chemistry			Major: BS in Biochemistry (new degree)			
Concentration (if applicable):			Degree: BS Biochem			
Fall	**credits**	**Spring**	**credits**	**Summer**	**credits**	**Notes**
GenEd A-1: ENG W131	3	BIO 119	4			
GenEd A-3: MA 154	3	MA 229	3			
GenEd B-4: CHM 115	4	CHM 116	4			
GenEd B-7: For Lang I	4	GenEd A/B: For Lang	4			
CHM 194	1					
Total Credits:	**15**	**Total Credits:**	**15**	**Total**		
Fall	**credits**	**Spring**	**credits**	**Summer**	**credits**	**Notes**
CHM 261	3	GenEd A-2: COM 114	3			
CHM 265	2	CHM 262	3			
MA 230	3	CHM 266	2			
BIO 117	4	GenEd A/B: ENG	3			
CHM 241	4	STAT 240 or 301	3			
Total Credits:	**16**	**Total Credits:**	**14**	**Total**		
Fall	**credits**	**Spring**	**credits**	**Summer**	**credits**	**Notes**
CHM 321	4	CHM 372	4			
PHYS 220	4	PHYS 221	4			
GenEd B-5 (PSY 120)	3	CHM 333	3			
GenEd B-6	3	BIOL 218	4			
CHM 280	1	CHM 335	1			
Total Credits:	**15**	**Total Credits:**	**16**	**Total**		
Fall	**credits**	**Spring**	**credits**	**Summer**	**credits**	**Notes**
CHM 533	3	CHM 534	3			
GenEd GCAP	3	CHM 535	1			
BIO 437 (Gen. Micro, w/lab)	4	Free electives	4			
Free electives (recommend but not require CHM 499)	4	BIO 537 (Immunobiol)	3			**SOC S161 as free elective for pre-med**
CHM 496	0	CHM 538 (Mol Biotech)	3			
		CHM 497	1			
Total Credits:	**14**	**Total Credits:**	**15**	**Total**		
Grand Total: 120						

- Not applicable (program does not exceed 120 credit hours)