

**COLLEGE OF ARTS AND SCIENCES  
NEW Major REVIEW FORM**

REVIEW ROUTING:

	Signature	Review Recommendation	Review Date
Major Originator	<u><i>James S. Barton</i></u>	<input checked="" type="checkbox"/> Approve	<u>4/21/06</u>
Department	<u><i>Health</i></u>	<input checked="" type="checkbox"/> Approve	<u>4/21/06</u>
Division	<u><i>Ronald J. Ar</i></u>	<u><i>Approve</i></u>	<u>5/5/06</u>
Dean CAS	<u><i>Barton S. McBure</i></u>	<u><i>Approved</i></u>	<u>5/15/06</u>
Curriculum Committee	<u><i>Loran B. Smith</i></u>	<u><i>Recommended</i></u>	<u>9/13/06</u>
Approved by College Faculty Council	<u><i>Michael K. Powell</i></u>		Date <u>10/11/06</u>
Approved by CAS Faculty	_____		Date _____

Degree and Name of Major: Bachelor of Science Degree in Biochemistry

**Part I General Information**

1. Are current library holdings adequate? Yes (  ) No (  ) If the answer is "no," what would be necessary to bring the library collection to an acceptable standard for this course offering?

Signature of Librarian *Wanda J. Dole*

2. Do you currently have the equipment and facilities (including sufficient WWW access, computer software, hardware) to teach this major? Yes.

3. If the answer to #2 is "no," what additional equipment and/or facilities will be needed? (Be specific as regards any technology needs in the way of WWW access, and computer software or hardware.)

4. Will new faculty, either full or part-time, be needed to offer this major? No.

5. Attach Major requirements and rationale for proposing the major.



**WASHBURN UNIVERSITY**  
Mabee Library

**MEMORANDUM**

To: Wanda V. Dole, Dean of University Libraries  
From: David Feinmark, <sup>df</sup>Coordinator of Collection Development & Management  
Date: May 2, 2006  
Subject: Proposal for Bachelor of Science in Biochemistry

As described in the New Major Review Form that was submitted, this proposed new major requires the creation of no new courses at the University.

This being said, information resources currently available through the University Libraries should be adequate to support the new major. Potential increases in the use of The Libraries' information resources should be monitored if dramatic upper division enrollment increases occur in later years.

## Bachelor of Science Degree in Biochemistry

Description: The curriculum for this program, which prepares students for graduate study in biochemistry and science related professional schools, such as medical, optometric, veterinary, etc., schools, also provides the requisite knowledge and skills for employment in a broad spectrum of venues, such as the pharmaceutical industry. This degree program meets the requirements of the ASBMB (American Society for Biochemistry and Molecular Biology) for a major in biochemistry composed of chemistry, biology, and other correlated courses. Currently in the nation, there are 814 programs recognized by the ASBMB. Eight are in Kansas, two of which are approved by the American Chemical Society. The requirements for the B.S. minor can be satisfied with 20 credits in biology and 10 in other natural science or mathematics courses are thus readily achieved by this proposed Bachelor of Science Biochemistry program.

The curriculum consists of existing science and mathematics courses in chemistry, biology, physics, and mathematics. No new courses are required for the proposed program. For the first two years, students in this program would take the same courses in chemistry as other majors. A notable feature of this program would be a higher population of students in existing upper division courses in chemistry and biology. This B.S. degree program is distinguished from the B.A. program in requiring calculus, general physics, and additional upper division courses in chemistry and biology in preparation for a professional scientific career. Other science departments were consulted in developing this program as students in this program would enroll in their courses.

## B.S. Degree, Major in Biochemistry

This program is designed for students seeking a career in the biomedical sciences and intending to pursue a professional advanced degree in that field.

### Chemistry Courses

TITLE	COURSE NUMBER	CREDITS
Fundamentals of Chemistry	CH 151 and CH 152	10
Organic Chemistry	CH 340, CH 342, CH 341, and CH 343	10
Analytical Chemistry	CH 320 and CH 321	4
Biochemistry	CH 350, CH 351, CH 352, and CH 353	10
Physical Chemistry	CH 381	3
Chemistry Research	CH 390	2
Chemistry Seminar	CH 391	1
<b>TOTAL</b>		<b>40</b>

### CORRELATED COURSES

TITLE	COURSE NUMBER	CREDITS
General Cellular Biology	BI 102	5
General Microbiology	BI 301	4
General Genetics	BI 333	4
Molecular Genetics	BI 353	3
Molecular Biology Lab	BI 380	3
<b>TOTAL</b>		<b>19</b>
Calculus*	MA 151	5
General Physics	PS 281 and PS282	10
Structured Programming	CIS 111	4
<b>TOTAL</b>		<b>19</b>

*\*Requires MA 116 and MA 117 or equivalent*

TOTAL SCIENCE AND MATH CREDITS

78

### REQUIRED BS MINOR - 30 Credits, For Example a Biology Minor

General Cellular Biology	BI 102	5
General Microbiology	BI 301	4
General Genetics	BI 333	4
Molecular Genetics	BI 353	3
Molecular Biology Lab	BI 380	3
One credit	BI Elective (300 level)	1
<b>TOTAL</b>		<b>20</b>
	CHOICE OF	
Calculus	MA 151 and PS281	10
	OR	
General Physics	PS 281 and PS282	10

UNIVERSITY AND GENERAL EDUCATION REQUIREMENTS:

English	EN 101 and EN 300	6
Mathematics	MA 116 or above	3
Humanities		9
Social Sciences		9
Natural Science and Math	BI 102, MA 151, PS 261/ PS281	9
Physical Education	PE 198	2
Total		38

TOTAL HOURS

Chemistry	40	40
Biology	19	19
Mathematics*	5	11
Physics	10	10
Computer Science	4	4
English	6	6
PE	2	2
General Education (nonScience)	18	18
Electives	20	14
TOTAL	124	124

\*MA 151 column one; MA 116 ,MA 117, and MA 151 second column

UPPER DIVISION CREDITS:

CH 340, CH 342, CH 341, and CH 343	10
CH 320 and CH 321	4
CH 350, CH 351, CH 352, and CH 353	10
CH 381	3
CH 390	2
CH 391	1
BI 301	4
BI 333	4
BI 353	3
BI 380	3
En 300	3
TOTAL	47

Credits Outside Major	124-40 = 84
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## Rationale for the Major: B.S. in Biochemistry

Current and potential Washburn University students increasingly express interest in a major in biochemistry, a popular major throughout the country as evidenced by the 814 colleges and universities registered with the ASBMB (American Society for Biochemistry and Molecular Biology), eight of which are in Kansas. The curriculum for this major meets the requirements of the ASBMB and includes all of the science and mathematics courses listed by the College Board as normally constituting a major in biochemistry. Currently, the biochemistry programs of two higher institutions of learning in Kansas are certified by the American Chemical Society (ACS). The B.S. major will be submitted to the ACS for certification.

This major will be attractive to students interested in advanced study in biochemistry, careers requiring a background in biochemistry and/or molecular biology, and medicine/health science related careers. Current chemistry students include a growing number requesting this major in biochemistry; we know of at least eight. Former chemistry students, who have gone on to science graduate professional schools (medical, pharmaceutical, etc.), fashioned their chemistry major to include a year of biochemistry courses and expressed, at the time, a sincere interest in obtaining a major in the field of biochemistry. In the past potential pre-medical students desiring this degree attended a different institution of higher education. A biochemistry program in place could be a magnet for drawing additional high quality students to Washburn University and would serve the needs of already matriculated students. In addition to finding the program listed on the Washburn University Chemistry Homepage, prospective students will be able look for a major in biochemistry on the internet and find Washburn listed by College Board.

The field of chemistry is increasingly emphasizing biochemistry as a discipline. A few years ago, the ACS required a biochemistry course for the certified major and initiated certification of biochemistry programs. The ACS weekly journal, Chemical and Engineering News, now devotes considerable space to biochemistry topics and features biochemical articles in most issues. Increasingly, major universities are changing chemistry department names to include the descriptive words of biochemistry or chemical biology. The ACS has several journals devoted to biochemistry and has just introduced the Journal of Chemical Biology. Governmental agencies that fund research at academic institutions target a significant portion of funds to the biochemical area. The Washburn University chemistry department is aware of these trends seeks to accommodate student interests with this program. In summary, with this biochemistry major, the chemistry department will be serving the needs of current and future students interested in a rapidly expanding division of chemistry.

Recommended Academic Schedule  
Bachelor of Science Degree  
Major in Biochemistry

Freshman

CH 151 Fundamentals of Chemistry I	5	CH 152 Fundamentals of Chemistry II	5
EN 101 Freshman Composition	3	BI 301 General Microbiology	4
BI 102 General Cellular Biology	5	General Education Course	6
PE 198 Lifetime Wellness	2		
Total Fall	15	Total Spring	15

Sophomore

CH 340 Organic Chemistry I	3	CH 341 Organic Chemistry II	3
CH 342 Organic Chemistry Lab I	2	CH 343 Organic Chemistry Lab II	2
MA 151 Calculus and Analytical Geometry I	5	PS 281 General Physics I	5
General Education Course	6	General Education Course	6
	16	Total Spring	16

Junior

CH 350 Biochemistry I	3	CH 352 Biochemistry II	3
CH 351 Biochemistry Lab I	2	CH 353 Biochemistry Lab II	2
PS 282 General Physics II	5	BI 333 General Genetics	4
EN 300 Advanced Composition	3	CH 390 Chemical Research	1
CH 390 Chemical Research	1	CM 111 Structured Programming	4
Elective	3	Elective	3
Total Fall	17	Total Spring	17

Senior

CH 320 Analytical Chemistry	3	BI 380 Molecular Biology Lab	3
CH 321 Analytical Chemistry Lab	1	CH 391	1
CH 381 Physical Chemistry I	3	BI Course with BI 102 prerequisite	1
BI 353 Molecular Genetics	3	Elective	7
Elective	6		
Total Fall	16	Total Spring	12

ASSESSMENT PLAN  
For  
Bachelor Degrees in Biochemistry

MISSION STATEMENT

Program Goal

Graduates of Washburn University with Bachelor Degrees in Biochemistry will have the requisite knowledge and skill foundation for continuing education in biochemistry or a science related professional school.

OBJECTIVES

The areas of knowledge central to the undergraduate degree with a major in biochemistry are:

- >knowledge of the fundamental principles of chemistry--atomic and molecular theory, reactivities and properties of chemical substances, and the states of matter;
- >knowledge of the primary subfields of chemistry--analytical, biochemical, inorganic, organic, and physical chemistry, appropriate to the degree;
- >knowledge of fundamental principles of biology and key principles of biochemistry and molecular biology;
- >knowledge of mathematics sufficient to facilitate the understanding and derivation of fundamental relationships and to analyze and manipulate experimental data;
- >knowledge of the fundamental principles of physics;
- >knowledge of safe practices in chemical, biochemical and biological laboratories.

Basic skills central to a major in biochemistry are:

- >the ability to problem solve and reason scientifically;
- >the ability to read, evaluate, and interpret information on a numerical, biochemical, chemical, and general scientific level;
- >the ability to assemble experimental equipment, to design experiments, to use appropriate apparatus to measure and observe characteristic biological, biochemical and chemical properties, and to use computers in acquisition, analysis, and presentation of data;

- >the ability to use effectively modern instrumentation in acquisition of physical, chemical, biochemical, and biological information;
- >the ability to communicate results of scientific inquiries verbally and in writing.

## ASSESSMENT METHODS

Assessment of knowledge and skills will be accomplished through American Chemical Society (ACS) examinations, laboratory portfolios, research project reports, seminar presentations, and student career outcomes. The results of evaluations will be reported to the chair of the department, who will maintain records on performance outcomes of majors as a group.

**ACS Examinations:** The cohort knowledge of the basic principles of chemistry and the fundamental subfields of chemistry -analytical, biochemical, inorganic, organic, and physical- will be evaluated through ACS examinations by comparison of class averages with national norms.

**Research Projects:** For their biochemistry research project, students will submit a report written in the form of the ACS Biochemistry journal. The report will be read and evaluated by two or more faculty.

**Seminar Presentations:** Two or more faculty will evaluate both the written and oral presentation of the major research topic in the field of biochemistry.

**Laboratory Portfolio:** Students will build a laboratory portfolio of output from instrumentation, computer computation, computer constructed molecules, and data acquisition. Portfolio quality will be judged by a minimum of two chemistry faculty members.

**Student Career Outcomes:** Measures will include the percentage of graduates who are admitted to graduate professional schools or who are employed in the science workforce. Data on both graduate supervisor and employer satisfaction will be collected and maintained by the chair of the Chemistry Department.

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Major Originator	<u>[Signature]</u>	<u>✓ Approve</u>	<u>4/21/06</u>
Department	<u>[Signature]</u>	<u>✓ Approve</u>	<u>4/21/06</u>
Division	<u>Ronald J. An</u>	<u>Approve</u>	<u>5/5/06</u>
Dean CAS	<u>Gordon D. McQuinn</u>	<u>Approved</u>	<u>5/15/06</u>
Curriculum Committee	<u>Loran B. Smith</u>	<u>Recommended</u>	<u>9/13/06</u>
Approved by College Faculty Council	<u>[Signature]</u>		Date <u>10/11/06</u>
Approved by CAS Faculty			Date _____

Degree and Name of Major: Bachelor of Arts Degree in Biochemistry

**Part I General Information**

1. Are current library holdings adequate? Yes (  ) No (  ) If the answer is "no," what would be necessary to bring the library collection to an acceptable standard for this course offering?

Signature of Librarian [Signature]

2. Do you currently have the equipment and facilities (including sufficient WWW access, computer software, hardware) to teach this major? Yes.

3. If the answer to #2 is "no," what additional equipment and/or facilities will be needed? (Be specific as regards any technology needs in the way of WWW access, and computer software or hardware.)

4. Will new faculty, either full or part-time, be needed to offer this major? No.

5. Attach Major requirements and rationale for proposing the major.



**WASHBURN UNIVERSITY**

Mabee Library

**MEMORANDUM**

To: Wanda V. Dole, Dean of University Libraries

From: David Feinmark, Coordinator of Collection Development & Management

Date: May 2, 2006

Subject: Proposal for Bachelor of Arts in Biochemistry

As described in the New Major Review Form that was submitted, this proposed new major requires the creation of no new courses at the University.

This being said, information resources currently available through the University Libraries should be adequate to support the new major. Potential increases in use of the Libraries' information resources should be monitored if dramatic upper division enrollment increases occur in later years.

## Bachelor of Arts Degree in Biochemistry

Description: The curriculum for this program, which prepares students for science related professional schools, such as medical, optometric, veterinary, etc., was developed to meet general admission requirements for a variety these graduate level programs. The ASBMB (American Society for Biochemistry and Molecular Biology) recommendations for a major in biochemistry were used as the model for this program, including the chemistry, biology, and correlated courses. Currently in the nation, there are 814 programs recognized by the ASBMB. Eight of those programs are located in Kansas and two of the Kansas programs are approved by the American Chemical Society.

The curriculum consists of existing science and mathematics courses in chemistry, biology, physics, and mathematics. No new courses are required for the proposed program. For the first two years, students in this program would take the same courses in chemistry as other majors. The distinguishing feature would be a higher population of students in upper existing division courses in chemistry and biology. Other science departments were consulted in developing this program as students in this program would enroll in their courses.

## B.A. Degree, Major in Biochemistry

This program is designed for students seeking a career in the biomedical sciences and intending to pursue a professional advanced degree in that field.

### Chemistry Courses

TITLE	COURSE NUMBER	CREDITS
Fundamentals of Chemistry	CH 151 and CH 152	10
Organic Chemistry	CH 340, CH 342, CH 341, and CH 343	10
Biochemistry	CH 350, CH 351, CH 352, and CH 353	10
Chemistry Research	CH 390	1
Chemistry Seminar	CH 391	1
<b>TOTAL</b>		<b>32</b>

### CORRELATED COURSES

TITLE	COURSE NUMBER	CREDITS
General Cellular Biology	BI 102	5
General Microbiology	BI 301	4
General Genetics	BI 333	4
Molecular Biology Lab	BI 380	3
<b>TOTAL</b>		<b>16</b>
Mathematics		
College Algebra*	MA 116	3
Trigonometry*	MA 117	3
College Physics/General Physics	PS 261 and PS262/ PS 281 and PS282	10

\* Or equivalent

### UPPER DIVISION

CH 340, CH 342, CH 341, and CH 343	10
CH 350, CH 351, CH 352, and CH 353	10
CH 390	1
CH 391	1
BI 301	4
BI 333	4
BI 380	3
EN 300	3
ELECTIVE	9
<b>TOTAL</b>	<b>45</b>

UNIVERSITY AND GENERAL EDUCATION REQUIREMENTS:

English	EN 101 and EN 300	6
Mathematics	MA 116 or above	3
A Modern Language	102	4
Humanities (Fine Arts 3 credits)		15
Social Sciences		15
Natural Science and Math	BI 102, MA 117, PS 261/ PS281	12
Physical Education	PE 198	2
Total		57

TOTAL CREDITS

Chemistry	32
Biology	16
Mathematics	6
Physics	10
English	6
PE	2
Language	4
General Education (nonScience)	30
Electives (9 upper division)	18
TOTAL	124
Total outside the major	92

## Rationale for the Major: B.A. in Biochemistry

Current and potential Washburn University students increasingly express interest in a major in biochemistry, a popular major throughout the country as evidenced by the 814 colleges and universities registered with the ASBMB (American Society for Biochemistry and Molecular Biology). Eight of these colleges are in Kansas. The curriculum for this major was developed from the recommendations of the ASBMB and includes all of the science and mathematics courses normally constituting a major in biochemistry as listed by the College Board.

This major will be particularly attractive to students interested in a medical or health science related major. Former chemistry students who have gone on to science graduate professional schools (medical, pharmaceutical) fashioned their chemistry major to include a year of biochemistry courses and wished they could have received a major in the field. In the past potential pre-medical students desiring this degree attended a different institution of higher education, and current students are requesting a major in biochemistry. A biochemistry program in place could be a magnet for drawing additional high quality students to Washburn University. An electronic canvas of medical schools in the plains/midwest states revealed that many either require or highly recommend biochemistry as an admission criterion. Thus this degree will serve the needs of students of chemistry planning a career in medicine. The ability to announce the program on the Washburn University Chemistry Homepage should bring prospective biochemistry students to Washburn. They will also come upon Washburn University when searching the internet for a major in biochemistry at websites, such as the College Board, devoted to serving college bound students. In summary, with this biochemistry major, the chemistry department will be serving the needs of current and future students interested in a rapidly expanding division of chemistry.

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Bachelor of Arts Degree  
Major in Biochemistry

Freshman

CH 151 Fundamentals of Chemistry I	5	CH 151 Fundamentals of Chemistry II	5
EN 101 Freshman Composition	3	BI 102 General Cellular Biology	5
MA 116 College Algebra	3	MA 117 Trigonometry	3
PE 198 Lifetime Wellness	2	General Education Course	3
General Education Course	3		
Total Fall	16	Total Spring	16

Sophomore

CH 340 Organic Chemistry I	3	CH 341 Organic Chemistry II	3
CH 342 Organic Chemistry Lab I	2	CH 343 Organic Chemistry Lab II	2
PS 261 College Physics I	5	PS 262 College Physics II	5
General Education Course	6	General Education Course	6
Total Fall	16	Total Spring	16

Junior

CH 350 Biochemistry I	3	CH 352 Biochemistry II	3
CH 351 Biochemistry Lab I	2	CH 353 Biochemistry Lab II	2
BI 301 General Microbiology	4	CH 390 Chemical Research	1
EN 300 Advanced Composition	3	General Education Course	3
Elective	3	Upper Division Elective	3
		FR/GE/SP 102	4
Total Fall	15	Total Spring	16

Senior

BI 333 General Genetics	4	BI 380 Molecular Biology Lab	3
General Education Course	6	CH 391	1
Upper Division Elective	3	Upper Division Elective	3
Elective	3	General Education	3
		Elective	3
Total Fall	16	Total Spring	13

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For  
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