Fiscal Unit/Academic Org	Biochemistry - D0310
Administering College/Academic Group	Arts And Sciences
Co-adminstering College/Academic Group	
Semester Conversion Designation	Re-envisioned with significant changes to program goals and/or curricular requirements (e.g., degree/major name changes, changes in program goals, changes in core requirements, structural changes to tracks/options/courses)
Current Program/Plan Name	Biochemistry
Proposed Program/Plan Name	Biochemistry
Program/Plan Code Abbreviation	BIOCHEM-BS
Current Degree Title	Bachelor of Science

Credit Hour Explanation

Program credit hour requirements		A) Number of credit hours in current program (Quarter credit hours)	B) Calculated result for 2/3rds of current (Semester credit hours)	C) Number of credit hours required for proposed program (Semester credit hours)	D) Change in credit hours
Total minimum credit hours required for completion of program		59	39.3	38	1.3
Required credit hours offered by the unit	Minimum	26	17.3	19	1.7
	Maximum	26	17.3	19	1.7
Required credit hours offered outside of the unit	Minimum	33	22.0	19	3.0
	Maximum	33	22.0	19	3.0
Required prerequisite credit hours not included above	Minimum	55	36.7	38	1.3
	Maximum	55	36.7	38	1.3

Program Learning Goals

Note: these are required for all undergraduate degree programs and majors now, and will be required for all graduate and professional degree programs in 2012. Nonetheless, all programs are encouraged to complete these now.

Program Learning Goals

- 1.1 Demonstrate an understanding of Mendelian, molecular, and population genetics, as well as molecular biology.
- 1.2 Discuss evolution, ecology, and organismal biology as a broader context for biochemical processes.
- 2.1 Understand the chemical, mathematical, and physical concepts required to describe biological processes.
- 2.2 Explain biochemical processes using the relevant chemical, mathematical, and physical concepts, including thermodynamics and kinetics.
- 2.3 Identify and reproduce the structures of biological molecules such as polypeptides, nucleic acids, carbohydrates, and lipids.
- 2.4 Explain how macromolecular structure and dynamics determine biological function of a biomolecule or biomolecular complex.
- 2.5 Describe the relative merits of various methods to determine molecular structure and dynamics.
- 2.6 Ilustrate an understanding of enzyme mechanisms and enzyme function, including the ability to utilize Michaelis-Menten kinetics.
- 3.1 Describe how enzymes and other biological molecules interact in metabolic pathways to carry out dynamic chemical changes in cells, including an understanding of feedback loops and energy flow, and how these relate to metabolic disorders.
- 3.2 Describe the regulation and control of gene expression, DNA repair, and DNA replication.
- 4.1 Demonstrate an understanding of the scientific method as it applies to the design of experiments and analysis of outcomes.
- 4.2 Conduct standard biochemical experiments in the laboratory and draw conclusions from experimental data.
- 4.3 Design appropriate experimental approaches to a biochemical problem using the theoretical basis for common laboratory experiments and procedures.
- 4.4 Communicate scientific concepts clearly and concisely, orally and in writing, including knowledge of scientific writing and presentation styles.
- 4.5 Understand the relationship of the major area to broader areas of science.
- 4.6 Interpret research seminars and articles from the current literature to demonstrate broader comprehension of research methods in Biochemistry.

Assessment

Assessment plan includes student learning goals, how those goals are evaluated, and how the information collected is used to improve student learning. An assessment plan is required for undergraduate majors and degrees. Graduate and professional degree programs are encouraged to complete this now, but will not be required to do so until 2012.

Is this a degree program (undergraduate, graduate, or professional) or major proposal? Yes

Does the degree program or major have an assessment plan on file with the university Office of Academic Affairs? Yes

Summarize how the program's current quarter-based assessment practices will be modified, if necessary, to fit the semester calendar.

The assessment plan for the Biochemistry major consists of a combination of embedded testing, laboratory reports, colloquium evaluations, Senior thesis (Honors), syllabus review, ASC Senior surveys, and student evaluation of instruction (SEI) for all courses.

The assessment process was evaluated during the summer of 2009 by the NMS Division of the College of Arts and Sciences (report is on file). Although the review panel found aspects for improvement, the report stated, “In almost all cases, the minimal criteria for the goals and objectives were met and often exceeded. A highlight of student achievement was the extensive participation by biochemistry students in undergraduate research.”

The assessment methods utilized for each learning outcome and associated course(s) were evaluated during that review. A brief summary of the assessment procedures is provided in a table included in the "Attachments" section.

These data are regularly used for curriculum development and to modify course content as needed as well as to establish trends over time and among instructors and as part of annual faculty/instructor review of course delivery and effectiveness of instruction.

Program Specializations/Sub-Plans

If you do not specify a program specialization/sub-plan it will be assumed you are submitting this program for all program specializations/sub-plans.

Pre-Major

Does this Program have a Pre-Major? No

Attachments

- Curriculum Map - Major BS degree REVISION 2.pdf: Curriculum Map - Major BS degree

  (Curricular Map(s). Owner: Swenson,Richard Paul)
- Biochemistry Major BS Degree Program Request Attachments REV_2.pdf: Attachments (letter, rationale,advising, etc)

  (Program Proposal. Owner: Swenson,Richard Paul)
- Biochemistry BS cover letter.doc: NMS Division of Arts and Sciences cover letter

  (Letter from the College to OAA. Owner: Andereck,Claude David)

Comments

- There were no substantive curriculum issues raised at the last College review. However, the attachments contain revised materials requested during the College review. The majority of the revisions are corrections to minor typos, wording, and the inclusion of alternative approved Chemistry courses in the suggested transition and semester schedules. The table of assessment of learning outcomes, which had been mistakenly omitted during the last submission, has now been included as part of the attachmemts. Justification is made for assigning the 5000-level numbering for the core biochemistry/physical biochemistry series. *(by Swenson,Richard Paul on 06/01/2011 12:40 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Swenson,Richard Paul	11/03/2010 01:37 PM	Submitted for Approval
Revision Requested	Swenson,Richard Paul	01/03/2011 01:47 PM	Unit Approval
Submitted	Swenson,Richard Paul	01/24/2011 03:28 PM	Submitted for Approval
Approved	Swenson,Richard Paul	01/27/2011 04:52 PM	Unit Approval
Revision Requested	Andereck,Claude David	02/02/2011 03:10 PM	College Approval
Submitted	Swenson,Richard Paul	06/01/2011 01:04 PM	Submitted for Approval
Approved	Swenson,Richard Paul	06/01/2011 01:40 PM	Unit Approval
Approved	Andereck,Claude David	06/03/2011 03:16 PM	College Approval
Pending Approval	Nolen,Dawn Jenkins,Mary Ellen Bigler Meyers,Catherine Anne Vankeerbergen,Bernadette Chantal Hanlin,Deborah Kay	06/03/2011 03:16 PM	ASCCAO Approval

College of Arts and Sciences

186 University Hall
230 North Oval Mall
Columbus, OH 43210

Phone (614) 292-8908
Fax (614) 247-7498

June 3, 2011

Larry Krissek
Chair, Arts and Sciences CCI

Dear Larry:

It is a pleasure to forward to you for consideration by the CCI and the Sciences Subcommittee the proposal for the Bachelor of Science major in Biochemistry under semesters. The program has been modified through the elimination of a course in analytical chemistry that is considered to be non-optimal for students in the program, and through the expansion of the current three quarter foundational sequence to a three semester sequence.

Beyond my own review of the documents, the proposal has been discussed by colleagues from other NMS units at a meeting on February 2, 2011. Feedback from these discussions has now been incorporated in the proposal.

If you have any questions, I would be happy to address them.

Sincerely,

David Andereck
Professor of Physics
Associate Dean of Natural and Mathematical Sciences, College of Arts and Sciences

Mark P. Foster, PhD

Department of Biochemistry
776 Biological Sciences
484 West 12th Avenue
Columbus, OH 43210-1214

Phone (614) 292-1377
Fax (614) 292-6773
E-mail foster.281.osu.edu
Web biosci.ohio-state.edu/~mfoster

Memo

To: Office of Academic Affairs

From: Mark P. Foster, Interim Chair, Department of Biochemistry

Date: 1/3/2011

Re: Semester Conversion Proposal – Biochemistry Major, B.S. Degree

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The Department of Biochemistry has the following programs to be converted for the quarter to semester system:

The Undergraduate Biochemistry major (B.S. degree)
The Undergraduate Biochemistry major (B.A. degree)
The Undergraduate Biochemistry minor
The Graduate Masters Degree (Thesis Option)
The Graduate Ph.D. Degree (This program is administered by the campus-wide Ohio State Biochemistry Program)

The subject of this proposal is the Undergraduate Biochemistry Major (B.S. degree). Other programs will be submitted separately either by this department or the OSBP.

Prof. Richard P. Swenson served as the Department's Semester Conversion Coordinator. The process began during the fall, 2009 and proceeded through the academic year. Dr. Swenson met regularly with the Department's Curriculum Committee and individually or in groups with the course instructors over this time to obtain both a broad and course specific perspective on the conversion of our undergraduate curriculum and major.

The proposed course conversions and associated changes to the major were discussed at several faculty meetings and final unanimous faculty approval for the undergraduate curriculum conversion was given at the April 7, 2010 meeting and as subsequently modified at its December 1, 2010 meeting. *

Mark P. Foster

*Note: Thirteen and 12 out of 15 eligible voting faculty were present at each meeting, respectively.

Program Rationale.

The Biochemistry major was thoroughly evaluated in 2007 as part of an internal departmental review. The overall conclusion that was reached was that the structure of the major was serving our students well. This conclusion was supported by the Colleges of the Arts and Sciences-instituted exit survey of graduating students in 2006 which indicated that the majority of the students responding were satisfied with the biochemistry coursework and quality of instruction. The structure of the major is built on a solid foundation of prerequisite courses in the physical and biological sciences and mathematics followed by a set of core courses that delve into the molecular biosciences in greater detail while providing the chemical and mathematical tools that are critical to the field of biochemistry. These prerequisite courses along with organic chemistry and advanced calculus are typically completed within the first two years of the program. Students then generally begin their core biochemistry courses during their second year. This basic structure will be retained in the semester system.

However, over the course of the past 5+ years, considerable time and effort has been devoted to updating the required courses in the biochemistry major, spurred largely by the efforts of new faculty in the department. The laboratory course, Biochemistry 521 (semester numbering: 5621), has been extensively modified to include contemporary techniques and more of a research emphasis. The Biochemistry series, 721.01-721.02-721.03 (semester numbering: 5721 and 5722) covering modern physical biochemistry have been infused with the theory and practical aspects of physical techniques for macromolecular structure determination. Finally, the year-long survey course, Biochemistry 613, 614, and 615, (semester numbering: 5613, 5614, and 5615, respectively) has been revised extensively to reflect recent advances in the molecular life sciences. The general course content, while adequate, has been determined to be under-emphasizing many of the new discoveries in the rapidly expanding life sciences. This issue will be addressed below. Our overall rationale for the semester conversion process is as follows.

Direct conversions. The basic core of the curriculum was left largely unaltered during the conversion to the semester format. Most of the prerequisites, non-departmental and departmental core courses will be converted directly following the 2/3 conversion process. Many of the prerequisites are currently three-quarter series and these will straightforwardly transition into a two-semester series format. It is presumed that content will remain largely as is within this format. This will be the case for the department's "Physical Biochemistry" series (5721 and 5722 in the semester system). These courses will all likely be taught in a 3-session/week, 55-min/session format. Alternatively, the 2-session/week, 80-min format may be implemented.

Rationale for expansion of the core biochemistry series for majors. The three-quarter core biochemistry series (Biochemistry 613-614-615) will be expanded to a three-semester series rather than to directly convert this three-quarter series to a two-semester plan. Our rationale is as follows. The field is rapidly expanding with new concepts added regularly through the massive efforts in research world-wide. This is especially true in the areas of gene expression and regulation, RNA biochemistry, structure, and processing. To better prepare our students, especially those who plan to enter professional or graduate school, this new material must be included. This expansion brings the department's core biochemistry curriculum more in line with our peer institutions that typically offer such three-semester series. Furthermore, the direct conversion of this three-quarter series to two semesters would have required the redistribution of course content in an inefficient manner. Metabolism, which is currently covered in Biochemistry 614, would likely have had to be split between two quarters, an outcome that was believed to be unacceptable. Continuity within the subject area is essential for the natural re-enforcement of central concepts with subareas and for retention. Also, the inclusion of a portion of metabolism in the second semester course of these series would significantly impair the proposed expansion of the subject areas discussed above. It is also concluded that these changes will bring our major core closer to our peer-institution comparison group.

Expanding the 613-614-615 quarter series to three semesters will require some changes in the manner in which our students move through the required core curriculum for the Biochemistry major. The principal issue is the smaller "margin of error" resulting from the 1.5 *versus* one year schedule. Students who might fail the first course in this series could lose substantial time in their progress towards graduation. To minimize this potential problem, 5613 with be taught during Spring Semester. Students will be advised to enroll in this course during their second year followed by 5614 and 5615 in the Autumn and Spring, respectively, of their third (Junior) year. With this schedule, students will be taking the final organic chemistry along with 5613. The course content of 5613 will be adjusted to accommodate a potential lag in acquiring some of the basic organic chemistry concepts required for that course. Finally, having our students begin their biochemistry earlier in their studies will assist efforts by the Department to foster an intellectual community of biochemistry students and to more quickly identify students who may benefit from independent study and/or basic research to augment their education. Under the current system, students typically have difficulties identifying and relating well to faculty who may foster their interests in this discipline.

Rationale for eliminating Chemistry 221 (Analytical Chemistry) requirement. In the course of our 2007 departmental review, students and faculty commented that the laboratory course, Chemistry 221 (Analytical Chemistry), is insufficiently geared towards a Biochemistry degree, and fails to provide a thorough grounding in basic techniques specific to the Biochemistry or Molecular Biology laboratory. The American Society for Biochemistry and Molecular Biology (http://www.asbmb.org/uploadedFiles/ProfessionalDevelopment/Resources/Curriculum_fnl_02.pdf)) does not include most of the topics covered in Chemistry 221 in the recommended curriculum for programs in Biochemistry and Molecular Biology. Furthermore, the conversion of the quarter course, Biochemistry 521 to semesters adds four additional weeks which provides additional time in Biochemistry 5621 to include quantitative skills and analytical techniques specific to the biochemical sciences, thus further reducing the need to include Analytical Chemistry laboratory as a core requirement in the major. For these reasons, we have decided to eliminate Chemistry 221 as a core requirement in the Biochemistry major. This change will benefit biochemistry students by providing more coherence within the major and would better prepare students to exploit and contribute to undergraduate research opportunities. Devoting more time to a joint laboratory experience in Biochemistry 5621 will foster more of a sense of intellectual community among Biochemistry undergraduates.

Rationale for semester course numbering for core Biochemistry and Physical Biochemistry series: Consideration was given to renumbering the core biochemistry and physical biochemistry series (613, 614, 615 721.01, 721.02, and 721.03 under quarters) at either the 4000- or 5000-level. Based on the numbering recommended policy, it was concluded that it was appropriate to number reach at the 5000-level, *i.e.* Biochemistry 5613, 5614, 5615, 5721 and 5722. This numbering was justified by an analysis of the clientele outside the biochemistry major. Graduate or professional students represent approximately 20% of the enrollment in these courses. Of these groups, the enrollment distribution is as follows:

Course:	613	614	615	721.01	721.02	721.03
% GS as Pharm-PhD:	32%	44%	18%	55%	14%	92%
% GS as Biophysics-PhD:	20%	17%	6%	40%	86%	8%
% GS (other)	12%	11%	53%	--	--	--

Thus, although there apparently is no formal requirement for these courses by these two programs, they are highly recommended and, therefore, numbering conforms to policy in that they represent "foundational coursework and research providing graduate or professional credit" as stipulated in the course numbering policy for 5000-level courses**.**

SUMMARY OF QUARTER TO SEMESTER CONVERSION OF BIOCHEMISTRY COURSES RELEVANT TO THE MAJOR

Current Course Number	Current Quarter Credit Hours	Level	Course Number	Suffix	Course Title	Transcript Abbreviation	Semstr Credit Hours	Fixed OR Variable Min	Variable Max	Repeatable?	Credit Hours/ Units Allowed	14 week	7 Week	4 Week (MayTerm)	12 Week (May + Summer)
H200	2	Undergrad	1900.	Honors	Early Experience in Research in Biochemistry: Seminar	Early Resrch Semin	Fixed	1.0		No		Yes			
H201	Variable	Undergrad	1998.	Honors	Early Experience in Research in Biochemistry: Laboratory	Early Resrch Lab	Variable	1.0	3.0	No		Yes			
294	Variable	Undergrad	2194.		Group Studies	Group Studies	Variable	1.0	4.0	Yes	8	Yes	Yes	Yes	Yes
698.01	Variable	Undergrad	3798.01		Study Tour: Domestic	Study Tour-Domesti	Variable	1.0	10.0	Yes	99	Yes	Yes	Yes	Yes
698.02	Variable	Undergrad	3798.02		Study Tour: Foreign	Study Tour-Foreign	Variable	1.0	10.0	Yes	99	Yes	Yes	Yes	Yes
693	Variable	Undergrad	4193.		Individual Studies	Individual Studies	Variable	1.0	7.0	Yes	28	Yes	Yes	Yes	Yes
694	Variable	Undergrad	4194.		Group Studies	Group Studies	Variable	1.0	4.0	Yes	16	Yes	Yes	Yes	Yes
699	Variable	Undergrad	4998.		Undergraduate Research in Biochemistry	Undergrad Research	Variable	1.0	5.0	Yes	15	Yes	Yes		Yes
(new)	Variable	Undergrad	4998.	Honors	Honors Undergraduate Research in Biochemistry	Undergrad Research	Variable	1.0	5.0	Yes	15	Yes	Yes		Yes
(new)		Undergrad	4999.		Thesis Research in Biochemistry	Thesis Research	Variable	1.0	5.0	Yes	15	Yes	Yes		Yes
H783	Variable	Undergrad	4999.	Honors	Honors Thesis Research in Biochemistry	Honors Research	Variable	1.0	5.0	Yes	15	Yes	Yes		Yes
(new)		Undergrad	5193.		Individual Studies	Group Studies	Variable	1.0	3.0	Yes	10	Yes	Yes		Yes
(new)		Undergrad	5194.		Group Studies	Group Studies	Variable	1.0	3.0	Yes	10	Yes	Yes		Yes
613	4	Undergrad	5613.		Biochemistry and Molecular Biology I	Biochem&Mol Biol 1	Fixed	3.0		No		Yes			
614	4	Undergrad	5614.		Biochemistry and Molecular Biology II	Biochem&Mol Biol 2	Fixed	3.0		No		Yes			
615	4	Undergrad	5615.		Biochemistry and Molecular Biology III	Biochem&Mol Biol 3	Fixed	3.0		No		Yes			
521	5	Undergrad	5621.		Biochemistry and Molecular Biology Laboratory	Biochem/MolBio Lab	Fixed	4.0		No		Yes			
H521	5	Undergrad	5621.	Honors	Biochemistry and Molecular Biology Laboratory	Biochem/MolBio Lab	Fixed	4.0		No		Yes			
721.01/.02	4.5	Undergrad	5721.		Physical Biochemistry I	Physical Biochem 1	Fixed	3.0		No		Yes			
721.02/.03	4.5	Undergrad	5722.		Physical Biochemistry II	Physical Biochem 2	Fixed	3.0		No		Yes			
Possible biochemistry electives:															
706	5	Graduate	6706.		Advanced Biological Chemistry Lab	Adv Biol Chem Lab	Fixed	4.0		No		Yes			
735/736	6	Graduate	6735.		Plant Biochemistry	Plant Biochemistry	Fixed	3.0		No		Yes			
761/766	6	Graduate	6761.		Advanced Biochemistry: Macromolecular Structure and	AdvBiochm-Macromol	Fixed	3.0		No		Yes			
762	3	Graduate	6762.		Advanced Biochemistry: Enzymes	AdvBiochm-Enzymes	Fixed	1.5		No		No	Yes		
763	2	Graduate	6763.		Advanced Biochemistry: Membranes and Lipids	AdvBiochm-Membrane	Fixed	1.5		No		No	Yes		
764	3	Graduate	6764.		Advanced Biochemistry: Metabolism	AdvBiochm-Metabol	Fixed	2.0		No		No	Yes		
765	3	Graduate	6765.		Advanced Biochemistry: Physical Biochemistry*	AdvBiochm-Physical	Fixed	3.0		No		Yes			
785	Variable	Graduate	6785.		Research Principles and Techniques	Res Prins & Techs	Variable	1.0	7.0	Yes	28	Yes	Yes		
795	Variable	Graduate	6795.		Special Topics in Biochemistry	Spcl Tpcs Biochem	Variable	1.0	2.0	Yes	28	Yes	Yes		
850	2	Graduate	6850.		Seminar in Biological Chemistry	Biochem Seminar	Fixed	1.0		Yes	28	Yes			
770	3	Graduate	7770.		Advanced Biochemistry: Protein Engineering	Protein Engineerng	Fixed	2.0		No		Yes			

Version: 03/03/2011

Fufillment of Learning Outcomes and Assessment - Biochemistry major - BS

1. Understand the relationship of biochemistry to broader areas of science		
	Fulfilled by:	Assessment method
1.1 Demonstrate an understanding of Mendelian, molecular, and population genetics, as well as molecular biology	Biology 1113 (or H1115)*; MolGen 4500 or 5606***	Syllabus review; instructor feedback
1.2 Discuss evolution, ecology, and organismal biology as a broader context for biochemical processes	Biology 1113, 1114 (or H1115, H1116)*, MolGen 4500 or 5606***	Syllabus review; instructor feedback
2. Apply chemical, mathematical, and physical concepts to describe biological processes		
2.1 Understand the chemical, mathematical, and physical concepts required to describe biological processes	Chem 1210 and 1220 or 1610 and 1620, 2510 and 2520; Math 1151.01 & 1152.01; Physics 1250 &1251; Biochem 5613***	Syllabus analysis; instructor feedback; faculty questionnaire; embedded quiz in Biochem 5613
2.2 Explain biochemical processes using the relevant chemical, mathematical, and physical concepts, including thermodynamics and kinetics	Biochemistry 5721 and 5722***	Embedded questions
2.3 Identify and reproduce the structures of biological molecules such as polypeptides, nucleic acids, carbohydrates, and lipids	Biology 1113 or H1115*; Biochemistry 5613-5615***	Syllabus review; embedded questions
2.4 Explain how macromolecular structure and dynamics determine biological function of a biomolecule or biomolecular complex	Biochemistry 5613, 5614, and 5615**, 5721 and 5722***	Embedded questions
2.5 Describe the relative merits of various methods to determine molecular structure and dynamics	Biochemistry 5613, 5614, and 5615**, 5721 and 5722***	Embedded questions
2.6 Illustrate an understanding of enzyme mechanisms and enzyme function, including the ability to utilize Michaelis-Menten kinetics to describe enzymatic activity	Biochemistry 5613, 5614, and 5615**, 5721 and 5722***	Embedded questions
3. Apply biochemical concepts to explain basic cellular processes		
3.1 Describe how enzymes and other biological molecules interact in metabolic pathways to carry out dynamic chemical changes in cells, including an understanding of feedback loops and energy flow, and how these relate to metabolic disorders	Biology 1113 or H1115*; Biochemistry 5614***	Embedded questions
3.2 Describe the regulation and control of gene expression, DNA repair, and DNA replication	Biology 1113*; reinforced in MolGen 4500 or 5606**, Biochemistry 5615***	Embedded questions

4. Use scientifically valid reasoning to investigate and articulate how biochemical knowledge is acquired		
4.1 Demonstrate an understanding of the scientific method as it applies to the design of experiments and analysis of outcomes	Lab components of chemistry courses**; Biochemistry 5621***, 6850**, research courses***	Laboratory reports, colloquium evaluations
4.2 Conduct standard chemical and biochemical experiments in the laboratory and draw conclusions from experimental data	Lab components of chemistry courses**; Biochemistry 5621***; research courses***	Laboratory reports; colloquium evaluations
4.3 Design appropriate experimental approaches to a biochemical problem using the theoretical basis for common laboratory experiments and procedures	All courses**, particularly Biochemistry 5621, 5721 and 5722***	Syllabus review; exams
4.4 Communicate scientific concepts clearly and concisely, orally and in writing, including knowledge of scientific writing and presentation styles.	Required lab courses; writing assignments (e.g. Biochem 5614 and 5615); seminars (Biochem 6850)	Colloquium evaluations; ASC Senior survey
4.5 Understand the relationship of the major area to broader areas of science.	All courses	Colloquium evaluations; ASC Senior survey
4.6 Interpret research seminars and articles from the current literature to demonstrate broader comprehension of research methods in Biochemistry.	Biochem 5615 (writing assignment), Biochem 6850; research courses	Colloquium evaluations
Fulfillment level: * Basic ** Intermediate *** Advanced		

COLLEGE OF ARTS AND SCIENCES - BACHELOR OF SCIENCE - MAJOR: BIOCHEMISTRY

Last name: _____ Address: _____

First Name: _____ _____

Middle: _____ City: _____

OSU ID: _____ Zip Code: _____

lastname.#: _____

Expected graduation: Semester: _____ Year: _____

Additional Majors: 1. _____ 2. _____

Additional Minors: 1. _____ 2. _____

Have you filed a degree application in the college office? Yes _____ No_____

(NOTE: This form is **NOT** a degree application)

Part A. Required Prerequisites (and/or supplementary requirements)

Course	*Hours*	*Grade*		*Course*	*Hours*	*Grade*
Biology 1113 (or H1115)	4			Math 1151.01	5	
Biology 1114 (or H1116)	4			Math 1152.01	5	
Chemistry 1610 (or 1210 or 1910H)	5			Physics 1250	5	
Chemistry 1620 (or 1220 or 1920H)	5			Physics 1251	5	

Part B. Major Program (Minimum grade of "C-" required. Minimum grade average of "C" (2.00))

Core Requirements (Substitutions are rarely, if ever, permitted)

Course	*Hours*	*Grade*		*Course*	*Hours*	*Grade*
Chemistry 2510	4			Biochemistry 5613	3	
Chemistry 2520	4			Biochemistry 5614	3	
Chemistry 2540	2			Biochemistry 5615	3	
Chemistry 2550	2			Biochem 5621 (or H5621)	4	
Math 2153.01	4			Biochem 5721 or Chem 4200or4300	3	
MolGen 4500 (or 5606)	3 (or 4)			Biochem 5722	3	

_____ (38 + optional hours)

Total of Part B only

Check whether this is: original _____ revision _____

See back for information about major programs.

Distribution: One copy each- _____ Student
_____ Dept Office
_____ College Office

_____
Signature of faculty advisor Date

_____
Name of advisor (please print)

_____
Signature of department advisor Date

For Biochemistry Students

Major Program Form

Colleges of the Arts and Sciences

Name _____ (last / first / middle) Major Biochemistry

OSU name.# _____ Degree Sought: BA ____ BS X BAJur ____

Local Address _____ (Zip) _____

Phone: _____ Expected date of graduation _____ (quarter), 20____ (year)

Have you filed a degree application in the college office? Yes ____ No ____
(Note: This form is **NOT** a degree application)

If completing two majors, list both below and file a separate form for each one:

1) _____ 2) _____

Part A. Required Prerequisites (and/or supplementary requirements)

Course	Hours	Grade	Course	Hours	Grade
Bio 113 (H115), 114 (H116)	5+5		Chem 123 or 203 or 163	5	
Chem 121 or 201 or 161	5		Phys 131, 132, 133	5+5+5	
Chem 122 or 202 or 162	5		Math 151, 152, 153	5+5+5	

Part B. Major Program (Minimum grade of "C–" required. Minimum grade average of "C" (2.00))
Core Requirements (Substitutions are rarely if ever permitted)

Course	Hours	Grade	Course	Hours	Grade
Chem 251	4		Biochem 613	4	
Chem 252	4		Biochem 614	4	
Chem 253	4		Biochem 615	4	
Chem 254	3		Biochem 521 (H521)	5	
Chem 255	3		Biochem 721.01	3	
Chem 221	5		Biochem 721.02	3	
Math 254	5		Biochem 721.03	3	
Molgen 500 (or 605, 606)	5				

_____ (59 + optional hours)
Total of Part B only

Check whether this is: original ____ revision ____

See back for information about major programs.

Distribution: One copy each – Student
College Office
Denney Hall

_____
Signature of faculty adviser Date

_____
Name of adviser (please print)

_____
Signature of department advisor Date

Biochemistry 292-6771
Department Campus Phone

GENERAL COLLEGE RULES PERTAINING TO ALL MAJORS

(Consult a departmental representative for specifics)

1. **Requirements for the Major.** The minimum requirement is a coherent program of related work amounting to not fewer than 40 hours of credit in courses numbered 200 or above as prescribed by the student's faculty adviser. (Many departments require more than 40 hours). The major may consist either of courses offered in only one department or of courses found in several allied departments; however, at least 20 of the 40 hours are to be in courses offered by the department of the major unless the major is an interdisciplinary one.

   Courses used to meet curricular requirements other than the major may not be used for the major, except for those courses which have been "starred" by the Arts and Sciences Faculty Curriculum Committee as having a significant writing component; such courses may be applied to Category I.A.2.b. of the basic liberal arts core even though they may be part of a major program.

   Prerequisites to the major may not be taken on a Pass/Non-Pass basis. Although grades of "D" may be accepted by some departments, others require a minimum "C–" for prerequisites; (consult your faculty adviser). Prerequisites may be applied concurrently to other curricular requirements wherever appropriate.

   Transfer credit. In order for a major to be approved with fewer than 20 hours of the program earned at The Ohio State University, the written approval of the faculty adviser, the chairperson of the department and the Vice Provost for the Arts and Sciences must be obtained.

2. **Grade Standards for the Major.** Courses taken on a Pass/Non-Pass basis may not be applied to the major.

   No course in which a grade lower than "C–" has been earned may be used to fulfill a major program requirement. If a student earns a "D+" or lower in a course on the major, the faculty adviser will decide whether the student should a.) repeat the course b.) delete the course from the major c.) substitute another course.

   It is incumbent upon the student to notify the faculty adviser if need for such action arises. Notice of the decision (on a major program revision form signed by the faculty adviser) should be delivered by the adviser or the student to the Arts and Sciences College Office.

   A minimum cumulative point-hour ratio of 2.00 in all courses comprising the major program is required for graduation.

3. **Changes in the Major Program.** Changes in a student's major program can be made only with the written approval of the faculty adviser. They must be filed in the Arts and Sciences Office (by the adviser or the student) at the time approval is given. Such revisions require a major program revision form or a new major program signed by the faculty adviser.

4. **Change of Major.** If a change of major is desired, the student should consult with a faculty adviser representing the new major and submit to the College Office either a PRELIMINARY MAJOR PLANNER or a MAJOR PROGRAM FORM, whichever seems appropriate. It should be borne in mind that changes may result in modifying graduation requirements to such an extent that the date of graduation will be delayed.

5. **Minimum Hours Required Outside the Department of the Major.**

   a.) For students who entered O.S.U. prior to Autumn 1983 and some transfer students entering later, the requirement is as follows:

   For the Bachelor of Arts degree a minimum of 115 hours outside the department of the major is required for graduation. This means that a maximum of 65 hours (including 100-level courses) from a single department may be applied to the usual 180 hours requirement. If hours in excess of 65 are earned, the usual 180 hours requirement is increased by an equal number of hours.

   The minimum required outside the major department for the Bachelor of Science degree is 105 hours.

   The minimum number of hours outside Journalism required for the Bachelor of Arts in Journalism is 141.

   b.) For students who enter O.S.U. Autumn Quarter 1983 or later, the requirement is the same for the Bachelor of Arts and the Bachelor of Science degree programs:

   A minimum of 116 hours outside the department of the major is required. This means that a maximum of 80 hours (including 100-level courses) from a single department may be applied to the usual 196 hours requirement. If hours in excess of 80 are earned, the usual 196 hours requirement is increased by an equal number of hours.

   For the Bachelor of Arts in Journalism the minimum hours required outside Journalism remains at 141 hours.

Transition policy statement.

The transition planning by the faculty was conducted in the context of the requirement that the conversion from quarters to semesters would not delay graduate or disrupt progress towards a degree. Most of the course conversions to the core curriculum should have minimal impact on the student's progress. However, the proposed expansion of the three-quarter Biochemistry 61x to a three-semester plan will have scheduling consequences. This transition has been discussed extensively. The transition strategy can be summarized as follows:

Current Seniors (AY 10/11): No issues, should have already completed 61x series or can do so under the current quarter system.

Current Juniors (AY 10/11): Again, should be few issues, should be able to complete series under quarter system in next two years.

Current Sophomores (AY 10/11): Should be able to complete series next year (as juniors) under the quarter system and are currently being contacted by their faculty academic advisor and strongly advised to make plans to do so. Student who should fail Biochemistry 613, which is currently offered only in the Autumn Quarter, will have the opportunity to retake an extra "bridge" offering of this course during the spring of 2012. These students would then continue the semester versions of 614 and 615 (*i.e.* 5614 and 5615) during their senior year. Students who have not completed the physical (bio)chemistry requirement by their junior year can do so within the semester system without any transitional issues.

Current Freshmen (AY 10/11): This group could begin the Biochemistry 561x series under the semester system in their junior and senior years. They shouldn't encounter transition issues with chemistry, mathematics, and physics prerequisites as these should be completed under the quarter system in the next two years. However, this group of students is being contacted on an ongoing basis by their faculty academic advisor and strongly encouraged to begin this core biochemistry series in their sophomore year by taking the extra "bridge" quarter version of Biochemistry 613 that will be offered in the Spring of 2012. They could then continue with semester versions of Biochemistry 614 and 615 (*i.e.* 5614 and 5615) during their junior year. See ***Appendix "Example T1 – Four-Year Transition……"*** for a tentative 4-year transitional schedule for this group of students.

Entering Freshmen for AY 11/12: Students will be contacted early in the fall of 2011 and provided detailed information regarding the transition to semesters, instructions and contact information for their academic advisor(s). Students will be advised to complete their mathematics and general chemistry prerequisite requirements under the current quarter systems during their first year. Their physics and organic chemistry prerequisites can straightforwardly be completed under the semester system beginning in their second year along with the initiation of the prescribed semester plan for all biochemistry course requirements, starting the Biochemistry 5613 during the Spring Semester. See ***Appendix "Example T2 – Four-Year Transition……"*** for a tentative 4-year transitional schedule for this group of students.

Entering Freshmen for AY 12/13: Will begin under the semester system with no transition issues. The expectation is that they will begin the core biochemistry series (as 5613) in the Spring of their sophomore year and proceed to the second and third courses of this series, 5614 and 5615, during the

Autumn and Spring Semesters, respectively, of their junior year. Students will normally have about 2.5 years in which to complete this three-semester series but, again, will be strongly encouraged to begin the series in their sophomore year to provide a one-year "buffer" to accommodate potential delays in an individual's academic progress. See ***Appendices "Examples S1 through S3, Four-Year Semester Schedule…."*** for 3 different tentative 4-year schedules under a complete semester system.

Transition issues related to the Biochemistry 721.01 through 721.03 series. It is rare that students do not complete the entire Physical Biochemistry series (Biochemistry 721.01-721.02-721.03) within the same academic year. Any student who has started the 721 series, but not completed it at the time of semester conversion will be advised individually as to the options for completing this sequence. The most likely solution will be to offer that student independent study credit for participating in the relevant portions of the semester courses and completing just the missing part of the sequence.

Transition issues related to the Chemistry, Physics, and Mathematics prerequisite sequences. In the event that a student has only partially completed Chemistry, Mathematics, or Physics sequences before the conversion to semesters, we will advise the student to follow the respective department's transition plans for those sequences.

Transition issues related to the dropping of the Chemistry 221 (Analytical Chemistry) requirement. The Chemistry 221 requirement will be phased out based on whether a student has taken Biochemistry 521 under quarters (Chemistry 221 is required) or Biochemistry 5621 under semesters (Chemistry 221 is NOT required).

Appendix. EXAMPLE T1: FOUR-YEAR TRANSITION FROM QUARTER TO SEMESTER SCHEDULE FOR THE BIOCHEMISTRY MAJOR (B.S.)

YEAR 1 UNDER QUARTER SYSTEM (AY 2010-2011):

Autumn Quarter:	***cr hr***	*Winter Quarter:*	***cr hr***	*Spring Quarter:*	***cr hr***
Biological Sciences 100	1	Biology 113 or H115	5		
Chemistry 121 or 161 or H201	5	Chemistry 122 or 162 or H202	5	Chemistry 123 or 163 or H203	5
Mathematics 151	5	Mathematics 152	5	Mathematics 153	5
GE or Free Elective	5			GE or Free Elective	5
	16		15		15

YEAR 2 UNDER QUARTER SYSTEM (AY 2011-2012):

Autumn Quarter:	***cr hr***	*Winter Quarter:*	***cr hr***	*Spring Quarter:*	***cr hr***
Chemistry 251	4	Chemistry 252	4	Chemistry 253	4
Chemistry 221**	5	Chemistry 254	3	Chemistry 255	3
Physics 131	5	Physics 132	5	Physics 133	5
Mathematics 254	5	GE or Free Elective	up to 5	Biochemistry 613 (bridge crse)	4
	19		17		16

YEAR 3 UNDER SEMESTER SYSTEM (AY 2012-13):

Autumn Semester:		*Spring Semester:*		*May Term:*
Biology II (1114)*	4			
Biochemistry II (5614)	3	Biochemistry III (5615)	3	(TBD)
Physical (Bio)chemistry (BC5721 or Chem 4200)	3	Physical Biochemistry (5722)	3	
Molecular Genetics (4500 or 5606)	3	Biochemistry Lab (5621)**	4	
GE or Free Elective	up to 3	GE or Free Elective	up to 6	
	16		16	

YEAR 4 UNDER SEMESTER SYSTEM (AY 2013-14):

Autumn Semester:		*Spring Semester:*		*May Term:*
Free Elective or Biochemistry 4193/4998	4	Free Elective or Biochemistry 4998/4999H	4	(TBD)
GE or Free Elective	up to 9	GE or Free Elective	up to 9	
	13		13	scrhr:

98	total quarter credit hrs	=	65	units	(2/3 conversion)
58	total semester units	=	58	units	
			123	units	(>120 crhr required)

* Students with advanced placement credit should be advised to take Biology 114 before their junior year.

** Students taking Biochemistry 5621 under the semester system will not be required to take Chemistry 221

Appendix. EXAMPLE T2 - FOUR-YEAR TRANSITION FROM QUARTER TO SEMESTER SCHEDULE FOR THE BIOCHEMISTRY MAJOR (B.S.)

YEAR 1 UNDER QUARTER SYSTEM (AY 2011-2012):

Autumn Quarter:	***cr hr***	*Winter Quarter:*	***cr hr***	*Spring Quarter:*	***cr hr***
Biological Sciences 100	1	Biology 113 or H115	5		
Chemistry 121 or 161 or H201	5	Chemistry 122 or 162 or H202	5	Chemistry 123 or 163 or H203	5
Mathematics 151	5	Mathematics 152	5	Mathematics 153	5
GE or Free Elective up to	5			GE or Free Elective up to	5
Total Credit hours	16		15		15

YEAR 2 UNDER SEMESTER SYSTEM (AY 2012-13):

Autumn Semester:		*Spring Semester:*		*May Term:*
Organic Chemistry I (2510)	4	Organic Chemistry II (2520)	4	(TBD)
Organic Chemistry Lab I (2540)	2	Organic Chemistry Lab II (2550)	2	
Physics I (1250)	5	Physics II (1251)	5	
Calculus III (Math 2153.01)	4	Biochemistry I (5613)	3	
GE or Free Elective	3	GE or Free Elective	5	
	18		19	

YEAR 3 UNDER SEMESTER SYSTEM (AY 2013-14):

Autumn Semester:		*Spring Semester:*		*May Term:*
Biology II (1114)*	4			
Biochemistry II (5614)	3	Biochemistry III (5615)	3	(TBD)
Physical (Bio)chemistry (BC5721 or Chem4200)	3	Physical Biochemistry (5722)	3	
Molecular Genetics (4500 or 5606)	3	Biochemistry Lab (5621)	4	
GE or Free Elective	3	GE or Free Elective up to	6	
	16		16	

YEAR 4 UNDER SEMESTER SYSTEM (AY 2014-15):

Autumn Semester:		*Spring Semester:*		*May Term:*
Free Elective or Biochemistry 4193/4998	4	Free Elective or Biochemistry 4998/4999H	4	(TBD)
GE or Free Elective up to	9	GE or Free Elective	9	
	13		13	scrhr:

46	total quarter credit hrs	=	31	units	(2/3 conversion)
95	total semester units	=	95	units	
			126	units	(>120 crhr required)

* Students with advanced placement credit should be advised to take Biology 114 before their junior year.

Appendix. EXAMPLE S1 - FOUR-YEAR SEMESTER SCHEDULE FOR THE BIOCHEMISTRY MAJOR (B.S.)

FRESHMAN YEAR:				
Autumn Semester:	***cr hr***	*Spring Semester:*	***cr hr***	*May Term:*
Biological Sciences 100 (Survey)	1			(TBD)
General Chemistry I (1210/1610/1910H)	5	General Chemistry II (1220/1620/1920H)	5	
Calculus I (Math 1151.01)	5	Calculus II (Math 1152.01)	5	
Biology I (1113)	4	GEC-"Writing Level 1" (English x110)	3	
GE or Free Elective	3	GE or Free Elective	3	
	18		16	

SOPHOMORE YEAR:				
Autumn Semester:		*Spring Semester:*		*May Term:*
Organic Chemistry I (2510)	4	Organic Chemistry II (2520)	4	(TBD)
Organic Chemistry Lab I (2540)	2	Organic Chemistry Lab II (2550)	2	
Physics I (1250)	5	Physics II (1251)	5	
Calculus III (Math 2153.01)	4	Biochemistry I (5613)	3	
GE or Free Elective	3	GE or Free Elective	3	
	18		17	

JUNIOR YEAR:				
Autumn Semester:		*Spring Semester:*		*May Term:*
Biology II (1114)*	4			
Biochemistry II (5614)	3	Biochemistry III (5615)	3	(TBD)
Physical (Bio)chemistry (BC5721 or Chem4200)	3	Physical Biochemistry (5722)	3	
Molecular Genetics (4500 or 5606)	3	Biochemistry Lab (5621)	4	
GE or Free Elective	3	GE or Free Elective up to	6	
	16		16	

SENIOR YEAR						
Autumn Semester:		*Spring Semester:*			*May Term:*	
Free Elective or Biochemistry 4193/4998	4	Free Elective or Biochemistry 4998/4999H	4		(TBD)	
GE or Free Elective up to	9	GE or Free Elective	9			
	13		13		scrhr:	
				major:	38	(>30 scrhr required)
Total Credit hours	65		62	overall:	127	(>120 crhr required)

* Students with advanced placement credit should be advised to take Biology 1114 before their junior year.

Appendix. EXAMPLE S2 - FOUR-YEAR SEMESTER SCHEDULE FOR THE BIOCHEMISTRY MAJOR (B.S.)

FRESHMAN YEAR:					
Autumn Semester:	***cr hr***	*Spring Semester:*	***cr hr***	*May Term:*	
Biological Sciences 100 (Survey)	1			(TBD)	
General Chemistry I (1210/1610/1910H)	5	General Chemistry II (1220/1620/1920H)	5		
Calculus I (Math 1151.01)	5	Calculus II (Math 1152.01)	5		
Biology I (1113)	4	GEC-"Writing Level 1" (English x110)	3		
GE or Free Elective	3	GE or Free Elective	3		
	18		16		
SOPHOMORE YEAR:					
Autumn Semester:		*Spring Semester:*		*May Term:*	
Organic Chemistry I (2510)	4	Organic Chemistry II (2520)	4	(TBD)	
Organic Chemistry Lab I (2540)	2	Organic Chemistry Lab II (2550)	2		
Physics I (1250)	5	Physics II (1251)	5		
Calculus III (Math 2153.01)	4	Biochemistry I (5613)	3		
GE or Free Elective	3	GE or Free Elective	3		
	18		17		
JUNIOR YEAR:					
Autumn Semester:		*Spring Semester:*		*May Term:*	
Biology II (1114)*	4				
Biochemistry II (5614)	3	Biochemistry III (5615)	3	(TBD)	
Molecular Genetics (4500 or 5606)	3	Biochemistry Lab (5621)	4		
GE or Free Elective	6	GE or Free Elective up to	9		
	16		16		
SENIOR YEAR					
Autumn Semester:		*Spring Semester:*		*May Term:*	
Free Elective or Biochemistry 4193/4998	4	Free Elective or Biochemistry 4998/4999H	4	(TBD)	
Physical (Bio)chemistry (BC5721 or Chem4200)	3	Physical Biochemistry (5722)	3		
GE or Free Elective up to	6	GE or Free Elective	6		
	13		13	scrhr:	
				major: 38	(>30 scrhr required)
Total Credit hours	65		62	overall: 127	(>120 crhr required)

* Students with advanced placement credit should be advised to take Biology 1114 before their junior year.

Appendix. EXAMPLE S3 - FOUR-YEAR SEMESTER SCHEDULE FOR THE BIOCHEMISTRY MAJOR (B.S.)

FRESHMAN YEAR:				
Autumn Semester:	***cr hr***	*Spring Semester:*	***cr hr***	*May Term:*
Biological Sciences 100 (Survey)	1			(TBD)
General Chemistry I (1210/1610/1920H)	5	General Chemistry II (1220/1620/1920H)	5	
Calculus I (Math 1151.01)	5	Calculus II (Math 1152.01)	5	
Biology I (1113)	4	GEC-"Writing Level 1" (English x110)	3	
GE or Free Elective	3	GE or Free Elective	3	
	18		16	
SOPHOMORE YEAR:				
Autumn Semester:		*Spring Semester:*		*May Term:*
Organic Chemistry I (2510)	4	Organic Chemistry II (2520)	4	(TBD)
Organic Chemistry Lab I (2540)	2	Organic Chemistry Lab II (2550)	2	
Physics I (1250)	5	Physics II (1251)	5	
GE or Free Elective	3	GE or Free Elective	6	
	14		17	
JUNIOR YEAR:				
Autumn Semester:		*Spring Semester:*		*May Term:*
Calculus III (Math 2153.01)	4	Biochemistry I (5613)	3	(TBD)
Biology II (1114)*	4	Molecular Genetics (4500 or 5606)	3	
GE or Free Elective up to	9	GE or Free Elective up to	9	
	17		12	
SENIOR YEAR				
Autumn Semester:		*Spring Semester:*		*May Term:*
Biochemistry II (5614)	3	Biochemistry III (5615)	3	(TBD)
Physical (Bio)chemistry (BC5721 or Chem4200)	3	Physical Biochemistry (5722)	3	
Biochemistry Lab (5621)	4	Free Elective or Biochemistry 4998/4999H	5	
GE or Free Elective up to	6	GE or Free Elective up to	6	
	16		17	scrhr:
			major:	38 (>30 scrhr required)
Total Credit hours	65		62 overall:	127 (>120 crhr required)

* Students with advanced placement credit should be advised to take Biology 1114 before their junior year.

Curriculum Map: Biochemistry BS Major - Conversion to Semesters (*version 1/17/2011*)

Segment of major program	Quarter course #	Quarter course name	Current Qtr Credit hours	Semester course #	Semester course name	Proposed Semester Units	Calculated Direct 2/3 Conversion	Change in Credit Hrs
Prerequisites (some may double-count in GEC)	Biology 113/H113	Introductory Biology I	5	Biology 1113	Introductory Biology I	4		
	Biology 114/H114	Introductory Biology II	5	Biology 1114	Introductory Biology II	4		
	Chemistry 121 or 161	General Chemistry I	5					
	Chemistry 122 or 162	General Chemistry II	5	Chemistry 1210 or 1610	General Chemistry I	5		
	Chemistry 123 or 163	General Chemistry III	5	Chemistry 1220 or 1620	General Chemistry II	5		
	Mathematics 151	Calculus and Analytic Geometry I	5					
	Mathematics 152	Calculus and Analytic Geometry I	5	Mathematics 1151.01	Calculus I	5		
	Mathematics 153	Calculus and Analytic Geometry I	5	Mathematics 1152.01	Calculus II	5		
	Physics 131	Introductory Physics: Calculus-based I	5					
	Physics 132	Introductory Physics: Calculus-based II	5	Physics 1250	Introductory Physics: Calculus-based I	5		
	Physics 133	Introductory Physics: Calculus-based III	5	Physics 1251	Introductory Physics: Calculus-based II	5		
		Total Prerequisites Quarter Credit Hours:	**55**		**Total Prerequisites Semester Units:**	**38**	**37**	**+1**
Core major requirements in department	Biochemistry 613	Biochemistry and Molecular Biology I	4	Biochemistry 5613	Biochemistry and Molecular Biology I	3		
	Biochemistry 614	Biochemistry and Molecular Biology II	4	Biochemistry 5614	Biochemistry and Molecular Biology II	3		
	Biochemistry 615	Biochemistry and Molecular Biology III	4	Biochemistry 5615	Biochemistry and Molecular Biology III	3		
	Biochemistry 521 (H521)	Introductory Biological Chemistry Laboratory	5	Biochemistry 5621 (H5621)	Biochemistry &Molecular Biology Laboratory	4		
	Biochemistry 721.01	Physical Biochemistry I	3					
	Biochemistry 721.02	Physical Biochemistry II	3	Biochemistry 5721	Physical Biochemistry I	3		
	Biochemistry 721.03	Physical Biochemistry II	3	Biochemistry 5722	Physical Biochemistry II	3		
		Total Core Major (Dept) Quarter Credit Hours:	**26**		**Total Core Major (Dept) Semester Units:**	**19**	**17**	**+2**
Core major requirements outside department	Chemistry 251	Organic Chemistry I	4	Chemistry 2510	Organic Chemistry I	4		
	Chemistry 252	Organic Chemistry II	4	Chemistry 2520	Organic Chemistry II	4		
	Chemistry 253	Organic Chemistry III	4					
	Chemistry 254	Organic Chemistry Laboratory I	3	Chemistry 2540	Organic Chemistry Laboratory I	2		
	Chemistry 255	Organic Chemistry Laboratory II	3	Chemistry 2550	Organic Chemistry Laboratory II	2		
	Chemistry 221	Analytical Chemistry	5					
	Mathematics 254	Calculus and Analytic Geometry IV	5	Mathematics 2153.01	Calculus III	4		
	Mol Gen 500 (or 605 & 606)	General Genetics	5	Mol Gen 4500 (or 5606)	General Genetics	3		
		Total Core Major (nonDept) Quarter Credit Hrs:	**33**		**Total Core Major (nonDept) Semester Units:**	**19**	**22**	**-3**
Total credit hours/units in major and prerequisites			**114**			**76**	**76**	**+0**
Major program percentage of minimum hours/units for degree (using 180 quarter credit hours and 120 semester units)			**63%**			**63%**		