May 18, 2007

MEMORANDUM

TO: Norma Allewell  
Dean, College of Chemical and Life Sciences

FROM: Phyllis Peres  
Associate Provost for Academic Planning and Programs

SUBJECT: Proposal to modify the curriculum of the B.S. in Biochemistry (PCC log no. 06065)

At its meeting today, the Senate Committee on Programs, Curricula and Courses approved your proposal to modify the curriculum of the B.S. in Biochemistry. A copy of the approved proposal is enclosed.

The changes are effective Fall 2007. The College should ensure that the change is fully described in the Undergraduate Catalog and in all relevant descriptive materials, and that all advisors are informed.

CWR/

Enclosure
cc: Richard Ellis, Chair, Senate PCC Committee  
Sarah Bauder, Office of Student Financial Aid  
Mary Giles, University Senate  
Barbara Hope, Data Administration  
Kathy McAdams, Undergraduate Studies  
Anne Turkos, Archives  
Linda Yokoi, Office of the Registrar  
Robert Infantino, College of Chemical and Life Sciences
THE UNIVERSITY OF MARYLAND, COLLEGE PARK
PROGRAM/CURRICULUM PROPOSAL

DIRECTIONS:
- Provide one form with original approval signatures in lines 1 - 4 for each proposed action. Keep this form to one page in length.
- Early consultation with the Office of the Associate Provost for Academic Planning & Programs is strongly recommended if there are questions or concerns, particularly with new programs.
- Please submit the signed form to Claudia Rector, Office of the Associate Provost for Academic Planning and Programs, 1119 Main Administration Building, Campus.
- Please email the rest of the proposal as an MSWord attachment to pcc-submissions@umd.edu.

DATE SUBMITTED__3/7/07__

COLLEGE/SCHOOL__Chemical and Life Sciences__

DEPARTMENT/PROGRAM__Biochemistry__

PROPOSED ACTION (A separate form for each) ADD_____ DELETE______ CHANGE__X___

DESCRIPTION (Provide a succinct account of the proposed action. Details should be provided in an attachment. Provide old and new sample programs for curriculum changes.)

To change the minimum grade requirements for required courses for the Biochemistry major, including all supporting courses, minimum acceptable grade in each course of C (2.0)

JUSTIFICATION/REASONS/RESOURCES (Briefly explain the reason for the proposed action. Identify the source of new resources that may be required. Details should be provided in an attachment.)

The current minimum grade requirements allow a small number of students who are not well prepared to progress into upper level biochemistry courses where they have significant difficulty. This proposal means to reduce the number of those students.

In addition, the grade requirements for all major courses are proposed to be fixed at a C (2.0) level. This is in preparation for the upcoming implementation of the plus/minus (+/-) grading scheme on campus. In the current environment on campus, a grade of C-counts as a 2.0 toward completion of a degree. With the lowering of a C- to a 1.7, it is theoretically possible for a student to complete all his or her degree requirements with a cumulative GPA below 2.0. This proposal aims to eliminate this possibility.

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APPROVAL SIGNATURES  - Please print name, sign, and date

1. Department Committee Chair

5-7-07
2. Department Chair

3. College/School PCC Chair

4. Dean

5. Dean of the Graduate School (if required)

6. Chair, Senate PCC

7. Chair of Senate

8. Vice President for Academic Affairs & Provost
Proposal to change the grade requirements for Chemistry (Major Code 19050) and Biochemistry (Major Code 04140) majors

Part 1. Supporting Courses Undergraduate students who major in chemistry or biochemistry are required to take five (5) lower level courses outside the Department of Chemistry and Biochemistry. These five courses must include two terms of calculus (MATH 140 and 141), two terms of calculus-based physics (there are several two semester course sequences offered by the Physics Department that will fulfill this requirement), and BSCI 105.

Currently, in order to fulfill the overall supporting course requirement, every student must attain an overall average grade point average (GPA) for the five supporting courses of 2.0. In practice, this means that a student who receives a grade of D in one supporting course can still complete the requirement by getting a grade of B in one of the other courses.

The Department proposes to change the supporting course grade requirement from a 2.0 average to a minimum grade of C (2.0) for each of the supporting courses.

Justification: Although the vast majority of chemistry and biochemistry majors complete the supporting courses without invoking the current 2.0 average GPA requirement, each year a small number of majors finish their supporting courses with a D in one or more of the courses. In practice, the majority of the D grades are in calculus (primarily MATH 141). These students will then proceed forward onto the upper level chemistry courses, including Physical Chemistry (CHEM 481, and CHEM 482 (BCHM 485 for biochemistry majors)). Physical chemistry is a mathematically rigorous discipline that explores the physical realities that define our world on both a macroscopic and microscopic scale. Physical chemistry requires a mathematical fluency in order to succeed in the courses, and students who lack this fluency universally struggle. In addition, many students take physical chemistry their senior year, which means that should they not pass the courses they will have to delay graduation.

The members of the faculty who teach physical chemistry courses and describe themselves as physical chemists are unanimous in their belief that the single biggest problem faced by students who struggle or fail in physical chemistry is a lack of math skills. By requiring an average level of math skills as a minimum prerequisite for physical chemistry, this proposal aims to remove the situation some of our majors find themselves in.

While the main impetus for this proposal is to require a higher level of math skills for our majors, the other supporting courses are included as well. While fewer students complete the supporting courses with grades of D in Physics, poor grades in physics also suggest that a student will struggle in physical chemistry; not only are the physics courses a required prerequisite for physical chemistry, but struggling in physics is suggestive of difficulty with application of math skills, which portends difficulty in physical chemistry. While low grades in BSCI 105 aren’t common, and aren’t necessarily a predictor of difficulty, as the last of the supporting courses it is included in the proposal.

Part 2. All courses required for a chemistry or biochemistry major. The minimum grade requirements for all other courses required for the major are likewise proposed to be fixed at a C (2.0) level. This proposed change is in preparation for the upcoming implementation of the plus/minus (+/-) grading scheme on campus. In the current environment on campus, a grade of C- counts as a 2.0 toward completion of a degree. With the lowering of a C- to a 1.7, it is possible for a student to complete all his or her degree requirements with a cumulative GPA below 2.0.
Such an outcome would result in students who were unable to achieve a bare minimum competency in the discipline still being awarded a degree. Such an outcome would stretch the integrity of the major and is undesirable in the eyes of the faculty. This proposal aims to eliminate that possibility.

Note on definition of C (2.0): While the current grading scheme at the University awards 2.0 grade points for any received grade of C (meaning C, C+ and C-), this will change upon the implementation of the plus/minus (+/-) grading scheme. In the new scheme, a grade of C- will be awarded 1.7 grade points. The Department proposes to require a minimum grade of C in all supporting and major-required courses; grades of C- will not be adequate.

Current grade requirement text:

Each required chemistry and biochemistry course must be passed with a minimum grade of C. Required supporting courses including BSCI 105 must be passed with a C average.

Proposed new grade requirement text:

Each course required for a chemistry or biochemistry major must be passed with a minimum grade of C (2.0). This includes all supporting courses.
**OLD: Biochemistry**

For Undergraduates Entering the University in Fall 2005 or Thereafter (proposed end date of August 2007)

(All Chemistry/Biochemistry Courses Require a Grade of “C” or Better)

**Majors Sequence**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 146</td>
<td>Principles of Gen Chem</td>
<td>(3)</td>
<td>CHEM 131</td>
<td>Fund. of Gen Chem</td>
<td>(3)</td>
</tr>
<tr>
<td>CHEM 147</td>
<td>Principles Lab</td>
<td>(1)</td>
<td>CHEM 132</td>
<td>Fundamentals Lab</td>
<td>(1)</td>
</tr>
<tr>
<td>CHEM 237</td>
<td>Organic I</td>
<td>(4)</td>
<td>CHEM 231</td>
<td>Organic I</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Lab</td>
<td>(1)</td>
<td>CHEM 232</td>
<td>Organic I Lab</td>
<td>(1)</td>
</tr>
<tr>
<td>CHEM 247</td>
<td>Organic II</td>
<td>(4)</td>
<td>CHEM 241</td>
<td>Organic II</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Lab</td>
<td>(1)</td>
<td>CHEM 242</td>
<td>Organic II Lab</td>
<td>(1)</td>
</tr>
<tr>
<td>CHEM 276</td>
<td>Gen Chem and Energetics</td>
<td>(2)</td>
<td>CHEM 271</td>
<td>(2) Gen Chem and Energetics</td>
<td>(2)</td>
</tr>
<tr>
<td>CHEM 277</td>
<td>Bioanalytical Lab</td>
<td>(3)</td>
<td>CHEM 272</td>
<td>Bioanalytical Lab</td>
<td>(2)</td>
</tr>
</tbody>
</table>

**Supporting Courses**

(Average of “C” or Better)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BSCI 105</td>
<td></td>
<td>(4)</td>
</tr>
<tr>
<td>MATH 141</td>
<td></td>
<td>(4)</td>
</tr>
<tr>
<td>MATH 140</td>
<td></td>
<td>(4)</td>
</tr>
<tr>
<td>PHYS 142</td>
<td></td>
<td>(4)</td>
</tr>
<tr>
<td>PHYS 141</td>
<td></td>
<td>(4)</td>
</tr>
<tr>
<td>MATH 241</td>
<td>(recommended)</td>
<td>(4)</td>
</tr>
<tr>
<td>PHYS 161</td>
<td></td>
<td>(3)</td>
</tr>
<tr>
<td>PHYS 260</td>
<td></td>
<td>(3)</td>
</tr>
<tr>
<td>PHYS 261</td>
<td></td>
<td>(1)</td>
</tr>
</tbody>
</table>

**Biological Sciences – Lower Level**

(One Course Minimum, Grade of “C” or Better)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSCI 207</td>
<td>Organismal Biology</td>
<td></td>
</tr>
<tr>
<td>BSCI 222</td>
<td>Principles of Genetics</td>
<td></td>
</tr>
<tr>
<td>BSCI 230</td>
<td>Cell Biology &amp; Physiology</td>
<td></td>
</tr>
<tr>
<td>BSCI 223</td>
<td>General Microbiology</td>
<td></td>
</tr>
</tbody>
</table>

**1st Semester Freshman Seminar (1-2 cr)**

HONR 100 (1) / UNIV 100 (1) / UNIV 101 (2)

**CORE Program**

**Fundamental Studies**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 101</td>
<td></td>
</tr>
<tr>
<td>ENGL 391 or 393 or 395</td>
<td></td>
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</tbody>
</table>

**Humanities and Arts (9 cr)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>HL:</td>
<td>Literature</td>
</tr>
<tr>
<td>HA:</td>
<td>Arts</td>
</tr>
<tr>
<td>HL/HA/HO:</td>
<td>Third Course</td>
</tr>
</tbody>
</table>

**Social Sciences (9 cr)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH:</td>
<td>Social/Political History</td>
</tr>
<tr>
<td>SB:</td>
<td>Behavioral/Social Sciences</td>
</tr>
</tbody>
</table>

**Diversity course (3 cr)**
### Required Upper Level Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 395</td>
<td>1</td>
<td>Professional Issues in Chem/Bchm</td>
<td>Spring semester only</td>
</tr>
<tr>
<td>CHEM 425</td>
<td>4</td>
<td>Instrumental Methods</td>
<td></td>
</tr>
<tr>
<td>CHEM 481</td>
<td>3</td>
<td>Physical Chemistry I</td>
<td></td>
</tr>
<tr>
<td>BCHM 485*</td>
<td>3</td>
<td>Physical Biochemistry</td>
<td>Spring semester only</td>
</tr>
<tr>
<td>CHEM 483</td>
<td>2</td>
<td>Physical Chemistry Lab I</td>
<td></td>
</tr>
<tr>
<td>BCHM 461</td>
<td>3</td>
<td>Biochemistry I</td>
<td></td>
</tr>
<tr>
<td>BCHM 462</td>
<td>3</td>
<td>Biochemistry II</td>
<td></td>
</tr>
<tr>
<td>BCHM 465</td>
<td>3</td>
<td>Biochemistry III</td>
<td></td>
</tr>
<tr>
<td>BCHM 464</td>
<td>3</td>
<td>Biochemistry Lab</td>
<td></td>
</tr>
</tbody>
</table>
* May take CHEM 482 instead

### Biological Sciences – Upper Level

(One Course Minimum, Grade of “C” or Better)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSCI 341</td>
<td>4</td>
<td>Introductory Plant Pathology</td>
</tr>
<tr>
<td>BSCI 410</td>
<td>3</td>
<td>Molecular Genetics</td>
</tr>
<tr>
<td>BSCI 411</td>
<td>3</td>
<td>Plant Genetics and Molecular Biology</td>
</tr>
<tr>
<td>BSCI 413</td>
<td>3</td>
<td>Recombinant DNA</td>
</tr>
<tr>
<td>BSCI 421</td>
<td>4</td>
<td>Cell Biology</td>
</tr>
<tr>
<td>BSCI 424</td>
<td>4</td>
<td>Pathogenic Microbiology</td>
</tr>
<tr>
<td>BSCI 426</td>
<td>3</td>
<td>Membrane Biophysics</td>
</tr>
<tr>
<td>BSCI 430</td>
<td>4</td>
<td>Developmental Biology</td>
</tr>
<tr>
<td>BSCI 432</td>
<td>3</td>
<td>Cell Differentiation</td>
</tr>
<tr>
<td>BSCI 433</td>
<td>3</td>
<td>Biology of Cancer</td>
</tr>
<tr>
<td>BSCI 434</td>
<td>4</td>
<td>Mammalian Histology</td>
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<tr>
<td>BSCI 440</td>
<td>4</td>
<td>Mammalian Physiology</td>
</tr>
<tr>
<td>BSCI 442</td>
<td>4</td>
<td>Plant Physiology</td>
</tr>
<tr>
<td>BSCI 443</td>
<td>3</td>
<td>Microbial Physiology</td>
</tr>
<tr>
<td>BSCI 445</td>
<td>4</td>
<td>Neurophysiology</td>
</tr>
<tr>
<td>BSCI 447</td>
<td>3</td>
<td>General Endocrinology</td>
</tr>
<tr>
<td>BSCI 471</td>
<td>3</td>
<td>Molecular Evolution</td>
</tr>
<tr>
<td>BSCI 485</td>
<td>4</td>
<td>Protozoology</td>
</tr>
<tr>
<td>BSCI 490</td>
<td>4</td>
<td>Plant Structure</td>
</tr>
</tbody>
</table>

### Upper Level CORE

**Advanced Studies** (6 credits – NOT a LFSC course, except Honors Thesis or Capstone)

<table>
<thead>
<tr>
<th>Course</th>
</tr>
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<tbody>
<tr>
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</tbody>
</table>

Capstone: Fulfilled with BCHM 465
New: Biochemistry

For Undergraduates Entering the University in Fall 2007 or Thereafter
(All Chemistry/Biochemistry Courses Require a Grade of “C (2.0)” or Better)

Majors Sequence
CHEM 146 (3) Principles of Gen Chem OR CHEM 131 (3) Fund. of Gen Chem
CHEM 147 (1) Principles Lab OR CHEM 132 (1) Fundamentals Lab
CHEM 237 (4) Organic I OR CHEM 231 (3) Organic I
CHEM 232 (1) Organic I Lab
CHEM 247 (4) Organic II OR CHEM 241 (3) Organic II
CHEM 242 (1) Organic II Lab
CHEM 276 (2) Gen Chem and Energetics OR CHEM 271 (2) Gen Chem and Energetics
CHEM 277 (3) Bioanalytical Lab OR CHEM 272 (2) Bioanalytical Lab

Supporting Courses
(All Supporting course Require a Minimum Grade of “C (2.0)” or Better)

BSCI 105 (4) _____ PHYS 141 (4) _____ PHYS 161 (3) _____
MATH 140 (4) _____ PHYS 142 (4) or PHYS 260 (3) _____
MATH 141 (4) _____ PHYS 261 (1) _____
MATH 241 (4) (recommended)

Biological Sciences – Lower Level
(One Course, Minimum Grade of “C (2.0)” or Better)

BSCI 207 (3) Organismal Biology _____
BSCI 222 (4) Principles of Genetics _____
BSCI 223 (4) General Microbiology _____
BSCI 230 (4) Cell Biology & Physiology _____

1st Semester Freshman Seminar (1-2 cr)
HONR 100 (1) / UNIV 100 (1) / UNIV 101 (2) _____

CORE Program

Fundamental Studies
ENGL 101
ENGL 391 or 393 or 395

Humanities and Arts (9 cr)
HL: Literature
HA: Arts
HL/HA/HO: Third Course

Social Sciences (9 cr)
SH: Social/Political History
SB: Behavioral/Social Sciences
SB: Behavioral/Social Sciences

Diversity course (3 cr)
**Required Upper Level Courses** *(Minimum Grade of “C (2.0)” or Better Required)*

- CHEM 395 (1) Professional Issues in Chem/Bchm  
  Spring semester only
- CHEM 425 (4) Instrumental Methods
- CHEM 481 (3) Physical Chemistry I
- BCHM 485*(3) Physical Biochemistry  
  Spring semester only
- CHEM 483 (2) Physical Chemistry Lab I
- BCHM 461 (3) Biochemistry I
- BCHM 462 (3) Biochemistry II
- BCHM 465 (3) Biochemistry III
- BCHM 464 (3) Biochemistry Lab

* May take CHEM 482 instead

**Biological Sciences – Upper Level** *(One Course, Minimum Grade of “C (2.0)” or Better Required)*

- BSCI 341 (4) Introductory Plant Pathology
- BSCI 410 (3) Molecular Genetics
- BSCI 411 (3) Plant Genetics and Molecular Biology
- BSCI 413 (3) Recombinant DNA
- BSCI 421 (4) Cell Biology
- BSCI 424 (4) Pathogenic Microbiology
- BSCI 426 (3) Membrane Biophysics
- BSCI 430 (4) Developmental Biology
- BSCI 432 (3) Cell Differentiation
- BSCI 433 (3) Biology of Cancer
- BSCI 434 (4) Mammalian Histology
- BSCI 440 (4) Mammalian Physiology
- BSCI 442 (4) Plant Physiology
- BSCI 443 (3) Microbial Physiology
- BSCI 445 (4) Neurophysiology
- BSCI 447 (3) General Endocrinology
- BSCI 471 (3) Molecular Evolution
- BSCI 485 (4) Protozoology
- BSCI 490 (4) Plant Structure

**Upper Level CORE**

**Advanced Studies** *(6 credits – NOT a LFSC course, except Honors Thesis or Capstone)*

Course 1:  
Capstone:  
  Fulfilled with BCHM 465
Claudia and Phyllis,

I'm writing to respond to your question about the impact of the proposed C (2.0) or better requirement on the "supporting course" category for CHEM and BCHM majors. This is a very legitimate question to raise, and I have provided data below which supports my contention that the impact of additional seats required because of this change will be very small. There are really two reasons for the proposed changes. One is to identify early students who have very fundamental skills problems in supporting course areas to their major. Typically, students squeaking through these requirements early with grades of C-/D are not succeeding in courses like physical chemistry and other upper level requirements, and often exhaust their repeat credit limit but don't do so until they "hit the wall" at 90+ credits. This new requirement will be an additional tool (along with sat. progress benchmarks) to help advise these students toward majors where they will be more successful - as early in their academic program as possible. A second rationale is to close a loophole. Currently, all BSCI majors are required to earn a C or better in supporting courses. This was instituted many years ago during a revision of the BSCI majors. This issue was not tackled by the CHEM/BCHM major at that time. In effect, we are holding CHEM/BCHM students to a lower standard -- a loophole we would like to close.

Here are the numbers:

A first, important issue to remember, is that the majority of both CHEM and BCHM majors place out of one or both MATH 140 and 141 through AP credit. Another subset of transfer students complete these requirements before they matriculate. I have focused by quick analysis on MATH, as the students would not get the PHYS requirement (MATH pre-req) without having successfully completing the MATH courses - we would hold this up in mandatory advising/pre-registration. BSCI 105 is under our roof, and the impact would be even smaller as this is typically not a course that gives these majors a lot of trouble.

I have based my analysis on all new students (FR and TR) entering the CHEM and BCHM majors in Fall 2006. Far fewer students enter these majors in Spring, and there are also few internal transfers.

CHEM Major:

37 students matric date of Fall 2006
11 students were registered for either MATH 140 or 141 in Fall 06
4 of the 11 earned grades of D or below (incl Ws)
Of the 4, 3 changed majors and 1 repeated the math course

BCHM Major:

76 students matric date of Fall 2006
34 students were registered for either MATH 140 or 141 in Fall 06
8 earned grades of D or below
Of the 8, 4 are repeating; 2 changed majors; 1 repeated by transfer, and 1 did not reenroll in the university.
Overall summary - of a potential world of around 100 new students, 45 were enrolled in a math course, 12 didn't succeed in their first attempt, and only 5 of these repeated the course.

I hope this information is helpful. Let me know if there are further questions.

Thanks,
Bob

Robert L. Infantino, Ph.D.
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e-mail: infantino@umd.edu
www.chemlife.umd.edu/biology/faculty/infantino/