Executive Summary: Undergraduate Biology

The biological sciences is a discipline that encompasses a broad array of overlapping and interrelated fields that range from molecular level biochemistry to cellular processes, organismal complexity, ecological interactions, and biological diversity. The complexity found across biological fields is explained through understanding of genetic mechanisms and evolutionary theory. The University of Kansas is fortunate to have a faculty in the biological sciences who are able to offer an undergraduate program that provides a breadth of degree options, which enables students to study at almost any level of biological organization.

There are no faculty lines assigned to Undergraduate Biology, instead faculty from the Department of Ecology & Evolutionary Biology (EEB) and Department of Molecular Biosciences (MB) contribute to Undergraduate Biology through their teaching of required and elective courses. Faculty from these departments are also engaged with academic advising and broader mentoring activities. In addition to EEB and MB faculty, Undergraduate Biology staff members and short-term instructors support the teaching mission of Undergraduate Biology, primarily through laboratory instruction and teaching in non-majors biology courses. Students enrolled in undergraduate biology courses have exceeded 13,300 for the past five years. Tenure-track faculty in EEB and MB teach the majority of biology lecture courses.

Undergraduate Biology staff members are directly or indirectly responsible for greater than 55% of instruction in KU undergraduate biology courses, primarily in laboratory courses (88% of majors labs) and service course lectures and laboratories that have enrolled more than 2,200 students per year for the past five years. In addition, more than 730 students have been enrolled in Edwards Campus biology lecture and laboratory courses since 2008. During the past five years, Undergraduate Biology Program staff members and lecturers have taught almost all Edwards Campus biology courses.

The Undergraduate Biology Program oversees four undergraduate biology majors: three on the Lawrence campus (Biochemistry, Biology, Microbiology) and one (Molecular Biosciences) on the Edwards Campus. A Bachelor of Arts and Bachelor of Science can be earned in Biochemistry, Biology, and Microbiology, and a Bachelor of Science can be earned in Molecular Biosciences. In addition, there are six subplan options within the B.S. Biology major: Cell Biology, Ecology & Evolutionary Biology, Genetics, Neurobiology, Organismal Biology, and Teaching Biology. The Teaching Biology option is offered in collaboration with KU’s UKanTeach Program and the School of Education. At the beginning of the 2011–2012 academic year, biology majors represented 47.6% of the undergraduates among the Natural Sciences and Mathematics departments at KU (61.3% if Human Biology majors are included) and the composite ACT scores of incoming students was, on average, higher than scores among students in the natural sciences and the College of Liberal Arts & Sciences in general. Students in biochemistry and microbiology have been particularly well prepared before entering KU.

Students pursuing degrees in the biological sciences graduate on average earlier than students in other natural sciences majors or when compared to CLAS as a whole, and biology majors are recognized on campus for their accomplishments with awards and scholarships, they compete successfully for national awards, and they are accepted into top tier graduate programs.
and medical schools around the country. Biology majors receive KU Undergraduate Research Awards, Watkins-Berger, Summerfield, and Chancellor scholarships, K-INBRE research awards (funded by the National Institutes of Health), American Society for Microbiology fellowships, Goldwater scholarships, and Fulbright grants. Four biology majors were selected this year as University Scholars as the top twenty sophomores in the KU Honors Program. Former KU biology majors have gone on to medical schools including Yale University, the University of Massachusetts, Emory University, and KU, and they have pursued Ph.D.s at universities such as Washington University in St. Louis and SUNY Stony Brook.

Undergraduate Biology Program staff members coordinate undergraduate academic advising, handle most routine advising, and work closely with students who have special circumstances involving degree requirements, transfer coursework, and graduation certification. Staff also coordinates and implement procedures that students follow to be admitted into all biology majors, serve as the liaison to CLAS and the University Advising Center on issues related to academic advising and degree requirements.

Class scheduling and biology class enrollment are linked to advising, but, from the administrative side of the process, one that is (mostly) transparent to students. The Scheduling Officer duties are handled by Undergraduate Biology Program staff members with input from and coordination with EEB and MB on biology course offerings, general class scheduling, preparing auditoria and special exam requests, resolving course and classroom schedule conflicts, and managing the schedule of instructional classroom and lab space. Staff also works with faculty to manage biology class enrollment that involves checks on prerequisites and evaluation of transfer coursework.

The review committee identified three concerns that need to be addressed in order to strengthen the Undergraduate Biology Program – 1) better coordination and more faculty involvement between Undergraduate Biology and the EEB and MB departments, 2) upgrade the Human Anatomy Laboratory physical space in order to better accommodate the demand for this service course, and 3) better articulate the mission of the Undergraduate Biology Program at the Edwards Campus. A Department Chair/Director level committee will be established and faculty liaison committee will be revived to better coordinate the efforts of Undergraduate Biology, EEB, and MB. Efforts are underway to review and revise the B.S. Molecular Biosciences degree program at the Edwards Campus in an effort to distinguish that program from the Lawrence campus biology program. With assistance from CLAS, Undergraduate Biology will be pursing options for upgrading the Human Anatomy facilities.

Because of the breath of degree offerings, the large numbers of undergraduates attracted to biology majors, and the coordination required between EEB and MB departments, this program will be continue.
Highlights: Biology

* Biology students are recognized campus-wide and nationally for academic accomplishments and community service, including a 2011 Ex.C.E.L. (Excellence in Community, Education and Leadership) Award finalist, a recipient of an American Society for Microbiology fellowship (1 of 39 nationwide) in 2011, four 2012 University Scholars (top twenty sophomores in the Honors Program), two Goldwater Scholarship recipients (2011 & 2012), and a Fulbright grant.

* Attracts a large percentage of very high ability students preparing for various biology career paths, including advanced degrees in biology and professional health programs.

* Among the publications by EEB or MB faculty in 2011, twenty-one included at least one KU undergraduate as an author.

* Biology majors on average graduate earlier than other natural science (or other CLAS) majors.

* Second-largest group of majors in the College of Liberal Arts & Sciences (CLAS).

* Administers biology curriculum, coordinates advising, and supports teaching of biology courses by partnering with KU's two biology departments: Department of Ecology & Evolutionary Biology (EEB) and Department of Molecular Biosciences (MB).

* Provides service lecture and laboratory courses for approximately 2,500 pre-health professions students per year.
The biological sciences is a discipline that encompasses a broad array of overlapping and interrelated fields that range from molecular level biochemistry to cellular processes, organismal complexity, ecological interactions, and biological diversity. The complexity found across biological fields is explained through understanding of genetic mechanisms and evolutionary theory. The University of Kansas is fortunate to have a faculty in the biological sciences who are able to offer an undergraduate program that provides a breadth of degree options, which enables students to study at almost any level of biological organization. The Undergraduate Biology Program’s (UBP) principle task is to handle the overall administration of KU’s undergraduate biology degrees.

This self-study document provides an overview of UBP including the majors and degrees it manages, UBP staff structure and responsibilities, and UBP goals and challenges.

UBP became an independent program in the middle of FY 2008 when the Division of Biological Sciences was split into three units: the Department of Ecology & Evolutionary Biology (EEB), the Department of Molecular Biosciences (MB), and the Undergraduate Biology Program. The charge of UBP was to administer the undergraduate biology degrees offered at KU and support the teaching mission of EEB and MB.
Biology majors and degrees

KU offers four undergraduate biology majors: three on the Lawrence campus (Biochemistry, Biology, Microbiology) and one (Molecular Biosciences) on the Edwards Campus. A Bachelor of Arts and Bachelor of Science can be earned in Biochemistry, Biology, and Microbiology, and a Bachelor of Science can be earned in Molecular Biosciences. In addition, there are six subplan options within the B.S. Biology major: Cell Biology, Ecology & Evolutionary Biology, Genetics, Neurobiology, Organismal Biology, and Teaching Biology. The Teaching Biology option is offered in collaboration with KU’s UKanTeach Program and the School of Education. Requirements for each major and degree option are included in Appendix I (pgs 13–24).

At the beginning of the 2011–2012 academic year, there were 1,031 students pursing a biology major (Table 1), a number that is lower than the previous four years and one that reflects the general decline in enrollment at KU during the past few years. Students are 2.3 times more likely to pursue a Biology major compared to Biochemistry, Microbiology, or Molecular Biosciences, and B.S. degrees are pursued at a higher rate than B.A. degrees, 70.7±5.2 (SD), 77.7±3.3, and 62.4±3.7 percent for biochemistry, microbiology, and biology, respectively, for the past five years. Biology majors represent 47.6% of the undergraduates among the Natural Sciences and Mathematics departments at KU (61.3% if Human Biology majors are included).

Table 1. Number of KU biology majors from Fall 2007 to Fall 2011.

<table>
<thead>
<tr>
<th></th>
<th>Biochemistry</th>
<th>Microbiology</th>
<th>Biology</th>
<th>Mol Bios*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>37</td>
<td>123</td>
<td>27</td>
<td>72</td>
<td>255</td>
</tr>
<tr>
<td></td>
<td>46</td>
<td>137</td>
<td>29</td>
<td>92</td>
<td>260</td>
</tr>
<tr>
<td></td>
<td>58</td>
<td>126</td>
<td>21</td>
<td>89</td>
<td>277</td>
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<td></td>
<td>51</td>
<td>115</td>
<td>22</td>
<td>81</td>
<td>327</td>
</tr>
<tr>
<td></td>
<td>54</td>
<td>96</td>
<td>22</td>
<td>89</td>
<td>307</td>
</tr>
</tbody>
</table>

* Edwards Campus major
Data from DEMIS, Sept 2011

The number of students per B.S. Biology subplan is presented in Table 2. Despite the current overall downward enrollment trends in undergraduate biology, there is a growing interest in Neurobiology among KU students. The increased interest in this discipline has been at the expense of Genetics and Organismal Biology. We do not anticipate ongoing growth in Teaching Biology because of the limited capacity of the UKanTeach Program.

Table 2. Number of students per B.S. Biology subplan for Fall 2007 to Fall 2011.
Undergraduate biology attracts academically talented students to the program as demonstrated by composite ACT scores which are, on average, higher than scores among students in the natural sciences and the College of Liberal Arts & Sciences in general (Table 3). Students in biochemistry and microbiology have been particularly well prepared before entering KU.

**Table 3.** Composite ACT scores for four KU biology disciplines, the natural sciences (NS), and the College of Liberal Arts & Sciences (CLAS).

<table>
<thead>
<tr>
<th></th>
<th>Biochemistry</th>
<th>Biology</th>
<th>Microbiology</th>
<th>Mol Biosci</th>
<th>NS</th>
<th>CLAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>28.0</td>
<td>26.6</td>
<td>26.4</td>
<td>27.3</td>
<td>26.3</td>
<td>24.8</td>
</tr>
<tr>
<td>2009</td>
<td>27.6</td>
<td>25.9</td>
<td>27.0</td>
<td>25.2</td>
<td>26.1</td>
<td>24.8</td>
</tr>
<tr>
<td>2008</td>
<td>27.7</td>
<td>26.0</td>
<td>26.7</td>
<td>25.2</td>
<td>26.1</td>
<td>24.7</td>
</tr>
<tr>
<td>2007</td>
<td>27.5</td>
<td>26.3</td>
<td>26.9</td>
<td>25.5</td>
<td>26.1</td>
<td>24.6</td>
</tr>
</tbody>
</table>

AIMS data from KU’s Institutional Research & Planning, Fall 2011

KU Undergraduate Biology compares favorably among its peer institutions in offering a breadth of undergraduate biology degree options (Table 4). UBP offers four academic major plans, and its peer institutions offer one to seven majors. Biology is one of the most popular majors at KU, as is the case for KU’s peers, although KU has the lowest percentage of biology majors compared with its peer institutions. KU offers a variety of B.A. and B.S. degree options, whereas several of its peers offer only B.A. or B.S. options or a limited variety of majors. KU does not differ appreciably from its peers in number or type of contributing biology departments, but it is one of three programs that do not have a human or integrative physiology department.

**Table 4.** Comparison of biology programs among KU’s peer institutions.
<table>
<thead>
<tr>
<th>Institution &amp; number of undergrads/tot al # in biology</th>
<th>Numer majors * offered</th>
<th>Majors offered</th>
<th># Majors enrolled</th>
<th>Biology departments</th>
<th>Structure**</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Colorado, Boulder</td>
<td>4</td>
<td>BA Biochemistry</td>
<td>428</td>
<td>Chemistry &amp; Biochem.</td>
<td>-Dept. advisors</td>
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<tr>
<td></td>
<td></td>
<td>BA Integrative Biology</td>
<td>1,384</td>
<td>Ecology &amp; Evol. Biol.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BA Mol., Cell. &amp; Devel. Biol.</td>
<td>775</td>
<td>Integrative Physiology</td>
<td></td>
</tr>
<tr>
<td>University of Iowa, Iowa City</td>
<td>7</td>
<td>BS Athletic Training</td>
<td>48</td>
<td>Biology</td>
<td>-Dept. advisor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BA &amp; BS Biology</td>
<td>636</td>
<td>Health &amp; Human Physiol.</td>
<td>-Director of Undergrad. Studies (faculty)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BA &amp; BS Biochemistry</td>
<td>160</td>
<td>Microbiology</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BA Health &amp; Human Physiology</td>
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<tr>
<td></td>
<td></td>
<td>BS Human Physiology</td>
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</tr>
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<td></td>
<td></td>
<td>BS Leisure Studies</td>
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<td></td>
<td>BS Microbiology</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>19,852/ 1,031</td>
<td></td>
<td>BA &amp; BS Biology</td>
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<td>Molecular Biosciences</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>BA &amp; BS Microbiology</td>
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<td></td>
<td>-Undergrad. Coord. (faculty)</td>
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<tr>
<td></td>
<td></td>
<td>BS Molecular Biosci.</td>
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<td></td>
</tr>
<tr>
<td>UNC Chapel Hill</td>
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<td>BA &amp; BS Biology</td>
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<td>-Undergrad. Biol. Student Serv. Office</td>
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<tr>
<td>18,579/ 1,705</td>
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<td></td>
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</tr>
<tr>
<td>University of Oklahoma, Norman</td>
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<td>-Dept. advisors</td>
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<td>19,480/ 1,473</td>
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<td>Botany &amp; Microbiology</td>
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<td>BS Microbiology</td>
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<tr>
<td></td>
<td></td>
<td>BS Zoology: Biomed. Sci.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Institution &amp; number of undergrads/tot al # in biology</td>
<td>Num ber majors * offered</td>
<td>Majors offered</td>
<td># Majors enrolle d</td>
<td>Biology departments</td>
<td>Structure**</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>--------------------------</td>
<td>----------------</td>
<td>------------------</td>
<td>---------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>University of Oregon, Eugene 20,631/ 1,775</td>
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<td>Biology</td>
<td>-Dept. advisors</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BA &amp; BS Marine Biolog.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Does not include subplans or concentrations
** All have faculty advisors
Undergraduate Biology Program staff

The UBP staff is comprised of twenty members including two lecturers, one lecturer/liaison, four Director of Laboratories, five Operational/Laboratory Technicians, one Audio Visual Technician, one Graphics/Publications Specialist, three Administrative Associates, one Administrative Assistant/Business Manager, one Assistant Director, and the Director of UBP. In addition, UBP hires and oversees short-term instructors for biology courses that are part of the Edwards Campus Molecular Biosciences major. UBP also hires between 170 and 180 undergraduate biology students as teaching assistants each year. Please see Appendix II (pg 25) for 2011 UBP organizational chart.

An independent UBP budget was developed starting with the 2009 fiscal year and the program, like all units at KU, has been asked to maintain its strength during the difficult financial times over the past three years. The UBP operating budget (OOE) was reduced following FY’10 while UTA and student hourly budgets were reduced following FY’10 and FY’09, respectively (Table 5). UBP has not been able to cover the operating costs associated with maintaining all undergraduate biology courses since FY’09. The instructor budget covers instructors for the Edwards Campus only and has remained mostly unchanged for the past four years. The instructor funds have allowed UBP to maintain the Edwards Campus Molecular Biosciences degree and the overall demand for biology courses in the MB major.

Table 5. Undergraduate Biology Program fiscal year budget for the prior four years.

<table>
<thead>
<tr>
<th></th>
<th>FY’09</th>
<th>FY’10</th>
<th>FY’11</th>
<th>FY’12</th>
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<td>OOE</td>
<td>$181,842</td>
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<td>UTA</td>
<td>$228,584</td>
<td>$229,420</td>
<td>$222,007</td>
<td>$222,077</td>
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<tr>
<td>student hourly</td>
<td>$19,099</td>
<td>$17,685</td>
<td>$17,685</td>
<td>$17,685</td>
</tr>
<tr>
<td>Instructor</td>
<td>$38,000</td>
<td>$32,000</td>
<td>$37,000</td>
<td>$37,000</td>
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</table>
Undergraduate Biology Program responsibilities

The responsibility of UBP to administer undergraduate biology majors and support the teaching mission of EEB and MB can be divided into three broad categories: instruction and instructional support, advising and course management, and general student and faculty services. In addition, UPB is the administrative home for KU’s Human Biology Program with 297 students currently pursuing a B.A. Human Biology degree.

Instruction and instructional support: Instruction and instructional support is UBP’s main responsibility, an area that involves direct instruction of most non-majors biology courses, biology courses taught at the KU Edwards Campus, and coordination of the majority of instructional laboratory courses. Students enrolled in undergraduate biology courses (BIOL courses numbered 100 to 699) have exceeded 13,300 for the past five years (Table 6). Tenure-track faculty in EEB and MB teach the vast majority of biology lecture courses; however, UBP supports instructional efforts through hiring of undergraduate teaching assistants (large lecture courses and several laboratory courses), supplies office support (photocopying syllabi and exams, organizing student course evaluation process), and handles all course scheduling and enrollment management.

Approximately 5,000 students have enrolled in undergraduate biology laboratory courses during each of the past five years, and greater than 4,400 have enrolled in laboratory courses that involve input and oversight from UBP staff (Table 6), including all introductory biology labs, core labs for most majors, and labs associated with service courses (human anatomy, human physiology, and microbiology). In most cases, lab operations are managed by a Director of Labs who oversees undergraduate teaching assistants, supports graduate teaching assistants, and supervises full time laboratory technicians.

UBP staff are directly responsible for instruction in two service course lectures (human anatomy and human physiology) and five service laboratory courses on the Lawrence campus that have impacted more than 2,200 students per year for the past five years (Table 6). In addition, more than 730 students have been enrolled in Edwards Campus biology lecture and laboratory courses since 2008 (Table 6). During the past five years, UBP staff and 13 different lecturers have taught almost all Edwards Campus biology courses.

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Labs</th>
<th>Service</th>
<th>Edwards</th>
</tr>
</thead>
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<tr>
<td>2011</td>
<td>13,411</td>
<td>4,469</td>
<td>2,539</td>
<td>775</td>
</tr>
<tr>
<td>2010</td>
<td>13,767</td>
<td>4,554</td>
<td>2,589</td>
<td>798</td>
</tr>
<tr>
<td>2009</td>
<td>14,093</td>
<td>4,923</td>
<td>2,528</td>
<td>783</td>
</tr>
<tr>
<td>2008</td>
<td>13,893</td>
<td>4,839</td>
<td>2,447</td>
<td>731</td>
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</table>
Service courses include two lecture courses (BIOL 240 and BIOL 246) and five laboratory courses (BIOL 203, 241, 242, 247, and 647).

Biology courses for which UBP staff had primary instructional responsibility for the past five years includes BIOL 101, 240, 246, 423, 424, 425, 440, 510, 512, 599, 616, 701 on the Lawrence campus and BIOL 350, 405, 417, 418, 420, 427, 435, 599, 600, 637, and 646 on the Edwards Campus. In addition, UPB staff have been involved with laboratory instruction in BIOL 102, 150, 152, 203, 402, 405, 241, 242, 247, 637, 639, and 647 on the Lawrence campus. All told, UBP staff are directly or indirectly responsible for greater than 55% of instruction in KU undergraduate biology courses.

It is challenging to measure the effectiveness of UBP’s efforts and the ultimate success of students graduating with biology degrees. However, two measures point to the success of both: time-to-graduation and performance on standardized exams. Students pursuing degrees in the biological sciences graduate on average earlier than students in other natural sciences majors or when compared to CLAS as a whole (Table 7). Students pursuing the Molecular Biosciences degree at the Edwards Campus are an exception primarily because this major specifically targets non-traditional students who are working full time while preparing for a career change into the biological sciences.

**Table 7.** Mean number of years to degree for four KU biology disciplines, the natural sciences (NS), and the College of Liberal Arts & Sciences (CLAS).

<table>
<thead>
<tr>
<th></th>
<th>Biochemistry</th>
<th>Biology</th>
<th>Microbiology</th>
<th>Mol Biosci</th>
<th>NS</th>
<th>CLAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>4.5</td>
<td>4.7</td>
<td>5.1</td>
<td>8.4</td>
<td>4.7</td>
<td>5.0</td>
</tr>
<tr>
<td>2009</td>
<td>4.9</td>
<td>4.4</td>
<td>4.9</td>
<td>7.0</td>
<td>4.9</td>
<td>5.0</td>
</tr>
<tr>
<td>2008</td>
<td>4.6</td>
<td>4.8</td>
<td>4.6</td>
<td>7.0</td>
<td>4.8</td>
<td>4.9</td>
</tr>
<tr>
<td>2007</td>
<td>4.3</td>
<td>4.5</td>
<td>4.8</td>
<td>4.5</td>
<td>4.9</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Scores on standardized exams for professional or graduate schools can be used as one measure of academic success among UBP students. Approximately 1,000 KU students completed the MCAT during the past five years, and of those who identified an undergraduate major, biochemistry majors consistently scored higher, on average, than their peers in other disciplines (Table 8). Microbiology, biology, and engineering majors also scored consistently well; however, MCAT scores of KU biology majors for 2010 (only data available) were below the national average (28.1±5.4).

**Table 8.** Mean ± SD composite MCAT scores for various majors, sub-majors, and disciplines. Majors were self-reported by the test takers selecting from an established list.
Biochemistry | 28.5 ± 4.7 | 27.2 ± 5.1 | 28.8 ± 4.9 | 28.5 ± 3.6 | 27.6 ± 5.4
Biology | 24.3 ± 5.6 | 25.3 ± 5.6 | 26.0 ± 6.2 | 26.0 ± 5.9 | 30.0 ± 5.9
Microbiology | 25.0 ± 4.2 | 26.3 ± 5.9 | 26.1 ± 4.1 | 26.6 ± 3.0 | 24.9 ± 6.1
Nat Sci/Math | 25.7 ± 3.7 | 24.3 ± 5.1 | 25.3 ± 5.9 | 24.1 ± 4.6 | 25.0 ± 5.1
Humanities | 25.0 ± 5.0 | 27.1 ± 5.4 | 24.9 ± 6.1 | 29.4 ± 3.4 | 24.6 ± 10.7
Soc Sci | 27.0 ± 4.8 | 21.7 ± 5.2 | 26.0 ± 3.5 | 28.2 ± 3.1 | 22.9 ± 4.6
Engineering | 26.0 ± 5.4 | 29.7 ± 3.7 | 28.7 ± 4.5 | 27.8 ± 6.6 | 27.2 ± 1.9
Other* | 26.4 ± 4.5 | 22.1 ± 6.3 | 23.5 ± 4.8 | 24.0 ± 5.1 | 22.8 ± 2.8

* Business, education, journalism, medical technology, nursing.

Overall, KU biology majors are recognized on campus for their accomplishments with awards and scholarships, they compete successfully for national awards, and they are accepted into top tier graduate programs and medical schools around the country. Drawing from former recipients of UBP’s BioScholarship, a four-year renewable scholarship available to incoming freshman biology students, our alumni’s awards include the following: KU Undergraduate Research Awards (UGRA); KU Watkins-Berger, Summerfield, and Chancellor scholarships; K-INBRE awards (funded by the National Institutes of Health); an American Society for Microbiology fellowship (39 awarded nationally in 2011); a Goldwater scholarship; and a Fulbright grant. Former KU BioScholars have gone on to medical schools including Yale University, the University of Massachusetts, Emory University, and KU, and they have pursued Ph.D.s at universities such as Washington University in St. Louis and SUNY Stony Brook.

**Advising and course management:** A second, critically important function of UBP is academic advising. EEB and MB faculty participate in academic advising and career counseling for undergraduates and graduate students; however, UBP staff are responsible for coordinating undergraduate academic advising and handling most routine advising in addition to working closely with students who have special circumstances involving degree requirements, transfer coursework, and graduation certification. UBP staff coordinate and implement procedures that students follow to be admitted into all biology majors and serve as the liaison to CLAS and the University Advising Center on issues related to academic advising and degree requirements. A faculty member from EEB (Gerrit de Boer) and from MB (Matthew Buechner) serve to integrate UBP advising efforts across the three biology units. UPB staff meet with approximately half of the undergraduate biology students for advising and graduation certification.

Class scheduling is linked to advising, but, from the administrative side of the process, one that is (mostly) transparent to students. The Scheduling Officer duties are handled by UBP staff with considerable input from and coordination with EEB and MB on biology course offerings, general class scheduling, preparing auditoria and special exam requests, resolving course and classroom schedule conflicts, and managing the schedule of all instructional lab space, two general purpose classrooms (first pass scheduling only), and two Haworth Hall conference rooms.
Finally, UBP staff work with faculty to manage biology class enrollment: e.g., generating/distributing enrollment permission numbers, checking students’ course prerequisites, adjusting course enrollment capacities, and adding or deleting courses where appropriate. Prerequisite checking often involves the evaluation of transfer coursework. UBP staff handle course evaluation requests, communicate with appropriate faculty for input, and relay results to students and CLAS graduation advisors (CLAS advisors are able to update student academic records to reflect transfer equivalencies).

In general, UBP staff serve as a resource for EEB and MB faculty for questions and procedures related to academic advising, degree requirements, course scheduling, and enrollment.

**General student and faculty services:** In addition to instruction and advising, UBP staff are responsible for a number of activities in support of the academic mission of the biological sciences.

* Administer academic misconduct cases: process paperwork, communicate with students and faculty, coordinate appeals, and submit case outcomes to CLAS.

* Manage the Biology Teaching Resource Center (BTRC), including instructional technology support for faculty and oversight of the Haworth Hall biology computer lab.

* Haworth Hall general building oversight; liaison with FO to handle faculty/staff requests for repairs, coordinate renovations, communicate information to EEB, MB, and UBP personnel regarding building issues.

* Personnel management of all UBP staff, including undergraduate teaching assistants.

* Facilitate EEB, MB, and UBP alumni outreach efforts; coordinated by Dr. Val Smith (EEB).

* Graphic design work for EEB, MB, and UBP including the production of BioHawk, an annual biology newsletter mailed to approximately 10,000 alumni. Handle contract work as requested.

* Mailroom activities; distribute campus and U.S. mail for EEB, MB, and UBP personnel

* Handle large EEB, MB, and UBP photocopy requests typically associated with biology courses (syllabi and exams). Track and bill photocopy usage by EEB, MB, and UBP personnel for two copy machines.

* Study Abroad liaison; evaluate biology courses offered by international institutions for undergraduate students who plan to study abroad.

* Coordinate UBP scholarship and awards; over 300 scholarships, awards, and travel grants have been dispersed to undergraduate biology majors in the past 20 years, 30 of which have been BioScholarships (four-year renewable scholarships for incoming, high ability freshmen).
* Coordinate the biology departmental honors program. Forty-seven students have successfully completed the biology honors requirements during the past five years; requirements include conducting independent research mentored by an EEB or MB faculty member, preparation of an honors thesis, presentation of research at the Biology Honors Research Symposium, and successful completion of BIOL 499, Introduction to Honors Research, and BIOL 699, Biology Honors Research Colloquium.

* Coordinate the annual biology graduation recognition ceremony. Approximately 120 graduating biology majors attend this event and bring their family and friends, totaling around 800–900 attendees. We announce each graduate and include information about his/her post-graduation plans, we present recipients of biology awards and scholarships, and we showcase the research projects of our departmental honors students.

**Goals for UBP**

UBP has been meeting its overall obligations, especially when one considers the success of more than 1,000 undergraduate biology majors who are advised and assisted toward the completion of their chosen major, the 2,500 students who have access to service courses each year, and the approximately 80 faculty members from EEB and MB who are supported in their teaching roles. UPB also employs close to 200 undergraduates as teaching assistants, laboratory preparatory workers, and BTRC staffers. UBP manages and coordinates a vast array of expectations with a very dedicated staff of professionals who work hard to ensure the success of our students.

UBP aspires to build on its successes, and, to this end, four goals have been identified that aim to strengthen the program.

1) Foster UBP’s relationship with EEB and MB in an effort to better serve KU’s biology majors with the specific goal of reviewing and updating the undergraduate biology curricula to include better integration of introductory biology material with core discipline-specific majors courses and to establish inquiry-based learning and critical thinking and writing throughout the curriculum. This goal will be particularly important as KU implements changes to its general education requirements.

2) Enhance research opportunities for undergraduates with outcomes that lead to REP certification and/or departmental honors. EEB and MB faculty are excellent at mentoring undergraduates in research projects that resulted in more than 125 undergraduates conducting research last year and yielded 21 publications that include undergraduates as authors. However, there are 1,000 undergraduate biology majors at KU and many have voiced an interest in gaining research experience but are frustrated in not finding a faculty mentor. UBP is exploring ways to facilitate student/faculty-mentoring opportunities and are engaging current undergraduate researchers to assist with this process.

3) Strengthen student performance leading to improved retention and shortened graduation times. KU biology majors as a group are among the top academic performers on the KU campus, but there are many students in the program who struggle with the curriculum. One cause of lower
academic performance has been attributed to poor performance in introductory biology courses, primarily due to lack of preparation or not understanding the importance of these courses as foundational for more advanced classes. In an effort to focus students’ attention on the importance of foundational courses and the value of adequate preparation, UBP is implementing admissions requirements that must be met before students can formally declare a biology major. The combination of more stringent course prerequisites and admissions requirements (BIOL 150, BIOL 152, BIOL 350, and CHEM 188; 2.2 GPA or higher) will set the foundation for better student performance throughout the curriculum. The outcome will yield students who are ultimately better prepared to meet the challenges of their chosen professions.

Establishing admission requirements enables UBP to initiate earlier and more consistent academic advising to students interested in the biological sciences. Advising and orienting second semester freshman will allow UBP to introduce students earlier to the degree options within UBP, the expectations of each major, and research opportunities available to them.

4) Improve infrastructure. The demand for seats in human anatomy and human physiology laboratories, driven by the growing need for health professionals (pharmacists, nurses, physical therapists in particular), has increased beyond the capacity of the laboratory space available to UBP. Infrastructure expansion and upgrades to existing facilities are necessary in order to meet this growing demand. UBP will pursue resources necessary to renovate Haworth Hall space in order to accommodate student demand for human anatomy and human physiology laboratory courses.

Challenges facing UBP

* Coordination of undergraduate biology degrees; there has been no real effort to formally identify who is responsible for what undergraduate biology degrees. EEB faculty oversee Organismal Biology and Ecology & Evolutionary Biology degree requirements, while MB faculty claim Biochemistry (B.A. & B.S.), Microbiology (B.A. & B.S.), and B.S. Biology options Cell Biology, Genetics, and Neurobiology, leaving B.A. Biology, B.S. Molecular Biosciences (Edwards), B.S. Teaching Biology, and B.A. Human Biology without strong faculty support. This “arrangement” leads to an ill-defined role for UBP and a lack of overall coordination among units regarding degree requirements, curriculum development, and efforts to measure learner outcomes. UBP has established an oversight committee comprised of faculty representation from EEB and MB; however, committee members have not demonstrated a vested interest in the affairs of UBP. Developing a clearly defined role for UBP and articulating the responsibilities of EEB, MB, and UBP in managing all undergraduate biology degrees is necessary to better serve KU’s undergraduate biology students.

* UBP graduates successfully launch careers that take them into professional programs (MD, DO, PA, genetic counseling, DDS, Opt, Vet Med, etc.), graduate programs (Ph.D., M.A./M.S.), or the workforce. Unfortunately, we have not established a strong link to our graduates and, therefore, do not have a good handle on UBP students’ overall successes once they leave KU. It has been difficult to identify ways of engaging our alumni that would allow UBP to better track its graduates’ career successes.
As an extension of UBP’s fourth goal, more space for human anatomy and human physiology lab courses is sorely needed, as are renovations and upgrades to existing space. It is difficult to meet the growing needs in this instructional area with current facilities and it is challenging to identify the resources necessary for expansion or renovations.

In addition to the need for laboratory space, UBP has been experiencing a growing need for experienced physiology, and to some extent microbiology, GTAs. Overall GTA numbers (from MB in particular) have not consistently met UBP’s laboratory instructional needs. Out-of-field graduate students and instructor are hired to cover GTA assignments, and often with assistance from CLAS and, to a lesser extent, the School of Pharmacy.

Two faculty members (Gerrit de Boer, EEB, and Matthew Buechner, MB) and two UBP staff members comprise a strong core of academic advisors for undergraduate biology majors, while EEB and MB faculty participate in some advising activities. However, greater support from EEB and MB faculty will be required to truly reach all 1,000 biology majors. Four dedicated individuals cannot adequately advise 1,000 students.

Identify and pursue funding opportunities in support of UBP objectives and responsibilities, including the above mentioned facility upgrades for anatomy and physiology laboratories.

The UBP is also tasked with staffing the Human Biology Program, which currently has close to 300 students enrolled. Human Biology is an interdepartmental program involving the departments of Anthropology, Applied Behavioral Science, Biology (EEB & MB), Psychology, and Speech-Language-Hearing Science. UBP staff handle all elements of Human Biology. Efforts are underway to establish an independent identity for Human Biology (a separate web presence is being developed), and a goal is to have greater involvement from all participating departments. Participation by all stakeholders will be necessary for Human Biology to develop a strong independent presence on the KU campus.
Appendix I. Requirements for each UBP degree and major.

**KU Undergraduate Biology (www.kuub.ku.edu)**
For students entering in/after Spring 2003

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**BIOCHEMISTRY**

**BACHELOR OF ARTS**

At least 120 hrs. (of which 45 must be Jr/Sr hrs.—courses numbered 300 or above) must be completed for graduation.

Completing the minimum requirements listed on this sheet will result in 121 overall hrs. and 34 Jr/Sr hrs.

Double majors must complete at least 15 hrs. unique to the major.

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**I. General College Requirements (55 hrs.):**

- English (9 hrs.): ENGL 101 ____; ENGL 102 (or 105) ____;
  ENGL 203 (or 205, 209, 210, 211)
- Argument & Reason (3 hrs. one of the following):
  COMS 130, 230, PHIL 148, 310
- Western Civilization (6 hrs.): HWC 204 (or 114) ____;
  HWC 205 (or 115) ____
- Principal Course Distribution Requirements: see:
  [http://www2.ku.edu/~clasus/pawc/principal_courses.shtml](http://www2.ku.edu/~clasus/pawc/principal_courses.shtml)
- Humanities (9 hrs.):
  *HT ____*, (HL) ____*, (HR) ____*
- Social Science (9 hrs.):
  *SC ____*, (SI) ____*, (SF) ____*
- Non-Western Culture (one course): see:
  [http://www2.ku.edu/~clasus/pawc/nonwest_culture_courses.shtml](http://www2.ku.edu/~clasus/pawc/nonwest_culture_courses.shtml)
- Foreign Language (16-20 hrs. or proficiency):
  ________, ________, ________, ________, ________, ________, ________, ________, ________, ________, ________, ________, ________, ________, ________, ________

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**II. General Science Requirements (35-39 hrs.):**

- CHEM 184 Foundations of Chemistry I (5 hrs.)
- CHEM 188 Foundations of Chemistry II (5 hrs.)
- CHEM 624 Organic Chem. I (3 hrs.)
- CHEM 625 Organic Chem. I lab (2 hrs.)
- CHEM 626 Organic Chem. II (3 hrs.)
- CHEM 640 Biol. Physical Chem. (3 hrs.)
- MATH 121 & MATH 122 Calculus I & II (6 hrs.) OR
  MATH 121 & MATH 122 Calculus I & II (10 hrs.)
- PHSX 211 & PHSX 212 Gen. Physics I & II (8 hrs.) OR
  PHSX 114 & PHSX 115 College Physics I & II (8 hrs.)

*Students who plan to attend graduate school should enroll in MATH 121 and 122.

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**III. Biochemistry Requirements (25 hrs.):**

- BIOL 150 (or 151, Honors) Principles of Molecular & Cellular Biology (4 hrs.)
- BIOL 152 (or 153, Honors) Principles of Organismal Biology (4 hrs.)
- BIOL 350 Principles of Genetics (3 hrs.)
- BIOL 636 Biochemistry I (3 hrs.)
- BIOL 637 Introductory Biochemistry Laboratory (2 hrs.)
- BIOL 638 Biochemistry II (3 hrs.)
- BIOL 639 Advanced Biochemistry Laboratory (2 hrs.)
- BIOL 672 Gene Expression (3 hrs.)
- BIOL 599 Senior Seminar in Biochemistry (1 hr.)
  *(must be taken in senior year)*

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**IV. Elective Requirements (6 hrs.):**

**Biology courses numbered 400 or higher must be selected in consultation with a Biochemistry advisor.** Some suggested courses are:

- BIOL 400 (or BIOL 401, Honors) Fundamentals of Microbiology
- BIOL 408 Physiology of Organisms
- BIOL 416 Cell Structure & Function
- BIOL 417 Biology of Development
- BIOL 424 Independent Study
- BIOL 646 Mammalian Physiology

No more than 3 hrs. of BIOL 423 Non-Lab Independent Study and/or BIOL 424 Independent Study (combined) can be applied towards the elective requirement.

- BIOL ____ (___ hrs.)
- BIOL ____ (___ hrs.)
- BIOL ____ (___ hrs.)
BIOCHEMISTRY

BACHELOR OF SCIENCE

At least 120 hrs. (of which 45 must be Jr/Sr hrs.—courses numbered 300 or above) must be completed for graduation.

Completing the minimum requirements listed on this sheet will result in 114 overall hrs. and 42 Jr/Sr hrs.

Double majors must complete at least 15 hrs. unique to the major.

I. General College Requirements (33 hrs.):

   English (9 hrs.): ENGL 101; ENGL 102 (or 105); ENGL 203 (or 205, 209, 210, 211)
   Argument & Reason (3 hrs., one of the following): ______
   COMS 130, 230, PHIL 148, 310
   Western Civilization (6 hrs.): HWC 204 (or 114); HWC 205 (or 115)

   Principal Course and/or Foreign Language Requirements
   (No more than one course from each topical subgroup from the principal course list can be applied toward fulfillment of this requirement. See:
   https://www2.ku.edu/~clasus/prwc/course_groups.shtml)

   Social Science (3 hrs.) ______; Humanities (3 hrs.) ______;
   and three additional courses in foreign language, social sciences, or humanities: ______, ______, ______.

II. General Science Requirements (44 hrs.):

   ______ CHEM 184 Foundations of Chemistry I (5 hrs.)
   ______ CHEM 188 Foundations of Chemistry II (5 hrs.)
   ______ CHEM 516 Analytical Chemistry (3 hrs.)
   ______ CHEM 624 Organic Chem. I (3 hrs.)
   ______ CHEM 625 Organic Chem. I lab (2 hrs.)
   ______ CHEM 626 Organic Chem. II (3 hrs.)
   ______ CHEM 627 Organic Chem. II lab (2 hrs.)
   ______ CHEM 640 Biol. Physical Chem. (3 hrs.) OR
   ______ CHEM 646 Physical Chem. (3 hrs.)
   ______ MATH 121 & MATH 122 Calculus I & II (10 hrs.)
   ______ PHYS 211 & PHYS 212 Gen. Physics I/II (8 hrs.) OR
   ______ PHYS 114 & PHYS 115 College Physics I/II (8 hrs.)

III. Biochemistry Requirements (25 hrs.):

   ______ BIOL 150 (or 151, Honors) Principles of Molecular & Cellular Biology (4 hrs.)
   ______ BIOL 152 (or 153, Honors) Principles of Organismal Biology (4 hrs.)
   ______ BIOL 350 Principles of Genetics (3 hrs.)
   ______ BIOL 636 Biochemistry I (3 hrs.)
   ______ BIOL 637 Introductory Biochemistry Laboratory (2 hrs.)
   ______ BIOL 638 Biochemistry II (3 hrs.)
   ______ BIOL 639 Advanced Biochemistry Laboratory (2 hrs.)
   ______ BIOL 672 Gene Expression (3 hrs.)
   ______ BIOL 599 Senior Seminar in Biochemistry (1 hr.) (must be taken in senior year)

IV. Elective Requirements (12 hrs.):

Biology courses, numbered 400 or higher, must be selected in consultation with a Biochemistry advisor. Some suggested courses are:

   ______ BIOL 400 (or BIOL 401, Honors) Fundamentals of Microbiology
   ______ BIOL 408 Physiology of Organisms
   ______ BIOL 416 Cell Structure & Function
   ______ BIOL 424 Independent Study
   ______ BIOL 430 Laboratory in Molecular Biology
   ______ BIOL 518 Microbial Genetics
   ______ BIOL 688 Molecular Biology of Cancer

or biology courses having a biochemistry course as a prerequisite. No more than 3 hrs. of BIOL 423 Non-Lab Independent Study and/or BIOL 424 Independent Study (combined) can be applied towards the elective requirement.

   ______ BIOL ______ (____ hrs.)
   ______ BIOL ______ (____ hrs.)
   ______ BIOL ______ (____ hrs.)
BIOLOGY

BACHELOR OF ARTS

At least 120 hrs. (of which 45 must be Jr/Sr hrs.—courses numbered 300 or above) must be completed for graduation.

Completing the minimum requirements listed on this sheet will result in 118 overall hrs. and 31 Jr/Sr hrs.

Double majors must complete at least 15 hrs. unique to the major.

I. General College Requirements (58 hrs.):

   **English** (9 hrs.; ENGL 101 ____, ENGL 102 (or 105) ____;
   ENGL 203 (or 205, 209, 210, 211))

   **Argument & Reason** (3 hrs., one of the following): ____
   COMS 130, 236, PHIL 148, 310

   **Western Civilization** (6 hrs.; HWC 204 (or 114) ____;
   HWC 205 (or 115) ____)

   **Principal Course Distribution Requirements** (see:
   http://www2.ku.edu/~class/pawc/principal_courses.shtml)

   **Humanities** (9 hrs.;)
   (HT) _____, (HL) ________, (HR) ________

   **Social Science** (9 hrs.;)
   (SC) __________, (SI) ________, (SP) ________

   **Non-Western Culture** (one course): (see:
   http://www2.ku.edu/~class/pawc/nonwest_culture_courses.shtml)

   **Foreign Language** (16-20 hrs. or proficiency):

   **Principal course in Earth Sciences or Mathematical Sciences**
   (3 hrs.) (in addition to MATH 115 or 121) or BIOL 570 ________

   **II. General Science Requirements (28-29 hrs.):**

   ____ CHEM 184 Foundations of Chemistry I (5 hrs.)
   ____ CHEM 185 Foundations of Chemistry II (5 hrs.)
   ____ CHEM 222 Fund. Organic Chemistry (3 hrs.) OR
   ____ CHEM 264 Organic Chemistry 1 (3 hrs.)
   ____ CHEM 265 Organic Chemistry I lab (2 hrs.)
   ____ MATH 121 Calculus I (5 hrs.) OR
   ____ MATH 115 & MATH 116 Calculus I & II (6 hrs.) OR
   ____ PHYS 114 & PHYS 115 Col. Physics I & II (8 hrs.) OR
   ____ PHYS 211 & PHYS 212 General Physics I & II (8 hrs.)

   **III. Biology Core Requirements (24-25 hrs.):**

   ____ BIOL 150 (or 151, Honors) Principles of Molecular
   & Cellular Biology (4 hrs.)
   ____ BIOL 152 (or 153, Honors) Principles of
   Organismal Biology (4 hrs.)

   **IV. Elective and Laboratory Requirements**
   (10 hrs.):

   **BIOL courses numbered 400 or higher which include at least 4 hrs. of laboratory credit.** Courses listed above which have not been used to fulfill the above requirements may be used as electives. No more than 3 hrs. of BIOL 423 Non-Lab Independent Study and/or BIOL 424 Independent Study (combined) can be applied towards the elective requirement with no more than 2 hours of BIOL 424 being applied towards the laboratory requirement.

   BIOL ____ (____ hrs.)
   BIOL ____ (____ hrs.)
   BIOL ____ (____ hrs.)
   BIOL ____ (____ lab hrs.)
   BIOL ____ (____ lab hrs.)

10/10/2011
CELL BIOLOGY

BACHELOR OF SCIENCE

At least 120 hrs. (of which 45 must be Jr/Sr hrs.—courses numbered 300 or above) must be completed for graduation.

Completing the minimum requirements listed on this sheet will result in 108 overall hrs. and 44 Jr/Sr hrs.

Double majors must complete at least 15 hrs. unique to the major.

I. General College Requirements (33 hrs):

   English (9 hrs.): ENGL 101 ____, ENGL 102 (or 105) ____;
   ENGL 205 (or 208, 209, 210, 211)
   Argument & Reason (3 hrs., one of the following): ___
   COMS 130, 230, PHIL 148, 310
   Western Civilization (6 hrs.): HWC 204 (or 114) ____;
   HWC 205 (or 115) ____

   Principal Course and/or Foreign Language Requirements
   (No more than one course from each topical subgroup from the
   principal course list can be applied toward fulfillment of this
   requirement. See: http://www2.ku.edu/~class/prw/principal_courses.shtml)

   Social Science (3 hrs.) ____; Humanities (3 hrs.) ____; and
   three additional courses in foreign language, social sciences, or
   humanities: ____ ____. ______

II. General Science Requirements (31-32 hrs):

   ___ CHEM 184 Foundations of Chemistry I (5 hrs.)
   ___ CHEM 188 Foundations of Chemistry II (5 hrs.)
   ___ CHEM 624 Organic Chem. I (3 hrs.)
   ___ CHEM 625 Organic Chemistry I lab (2 hrs.)
   ___ CHEM 626 Organic Chemistry II (3 hrs.)
   ___ MATH 121 Calculus I (5 hrs.) OR
   ___ MATH 115 & MATH 116 Calculus I & II (6 hrs.)
   ___ PHSX 114 & PHSX 115 Coll. Physics I & II (8 hrs. OR
   ___ PHSX 211 & PHSX 212 Gen. Physics I & II (8 hrs.)

III. General Biology Requirements (21 hrs.):

   ___ BIOL 150 (or 151, Honors) Principles of Molecular &
   Cellular Biology (4 hrs.)
   ___ BIOL 152 (or 153, Honors) Principles of Organismal
   Biology (4 hrs.)
   ___ BIOL 350 Principles of Genetics (3 hrs.)
   ___ BIOL 408 Physiology of Organisms (3 hrs.)
   ___ BIOL 412 Evolutionary Biology (3 hrs.)
   ___ BIOL 600 Intro. Biochemistry (4 hrs.)

IV. Cell Biology Requirements (19 hrs.):

   ___ BIOL 416 Cell Structure & Function (3 hrs.)
   ___ BIOL 417 Biology of Development (3 hrs.)
   ___ BIOL 426 Laboratory in Cell Biology (3 hrs.)
   ___ BIOL 599 Senior Seminar in Cell Biology (1 hr.)
   (must be taken in senior year)

   ___ Cell Biology Electives (9 hrs. from the following list):
   ___ BIOL 400 (or BIOL 401, Honors) Fundamentals
   of Microbiology (3 hrs.)
   ___ BIOL 402 Fund./Microbiology Lab (2 hrs.)
   ___ BIOL 435 Introduction to Neurobiology (3 hrs.)
   ___ BIOL 503 Immunology (3 hrs.)
   ___ BIOL 504 Immunology Lab (2 hrs.)
   ___ BIOL 512 General Virology (3 hrs.)
   ___ BIOL 513 Virology Lab (2 hrs.)
   ___ BIOL 570 Introduction to Biostatistics (3 hrs.)
   ___ BIOL 646 Musculoskeletal Physiology (4 hrs.)
   ___ BIOL 673 Cellular/Molecular Neurobiology (3 hrs.)
   ___ BIOL 682 Molecular Biology of Cancer (3 hrs.)
   ___ BIOL 719 Light and Electron Microscopy (3 hrs.)
   ___ BIOL 752 Cell Biology (3 hrs.)
   ___ BIOL 755 Mechanisms of Development (3 hrs.)
   ___ BIOL 756 Cell and Tissue Culture Laboratory (3 hrs.)

V. Seminar/Laboratory Requirements (4 hrs.):

   At least 2 hrs. of laboratory credit (BIOL laboratories
   numbered 400 or higher) and 2 hrs. of a seminar/topics course
   (BIOL 419, 420, 499, 701). Two hours of BIOL 424 will
   satisfy the laboratory credit requirement.

   BIOL ___ (____ lab hrs.)
   BIOL ___ (____ seminar hrs.)

10/10/2011
ECOLOGY & EVOLUTIONARY BIOLOGY

BACHELOR OF SCIENCE

At least 120 hrs. (of which 45 must be Jr/Sr hrs.—courses numbered 300 or above) must be completed for graduation.

Completing the minimum requirements listed on this sheet will result in 107 overall hrs. and 43 Jr/Sr hrs.

Double majors must complete at least 15 hrs. unique to the major.

I. General College Requirements (33 hrs):

English (9 hrs.): ENGL 101; ENGL 102 (or 105); ENGL 203 (or 205, 209, 210, 211)
Argument & Reason (3 hrs., one of the following):  
COMS 130, 230, PHIL 148, 310
Western Civilization (6 hrs.): HWC 204 (or 114)
HWC 205 (or 115)
Principal Course and Foreign Language Requirements  
(No more than one course from each topical subgroup from the principal course list can be applied toward fulfillment of this requirement. See:  
http://www2.ku.edu/~clasctprincip/foreign_course.html)
Social Science (3 hrs.): Humanities (3 hrs.)
and three additional courses in foreign language, social sciences, or humanities: , , .

II. General Science Requirements (26-27 hrs):

CHEM 184 Foundations of Chemistry I (5 hrs.)
CHEM 188 Foundations of Chemistry II (5 hrs.)
CHEM 622 Fund. Organic Chem. (3 hrs.) OR
CHEM 624 Organic Chem. I (3 hrs.)
MATH 121 Calculus I (5 hrs.) OR
MATH 115 & MATH 116 Calculus I & II (6 hrs.)

TWO OF THE FOLLOWING COURSES:

PHSX 114, PHSX 115 College Physics I & II (8 hrs.),  
OR PHSX 211, PHSX 212 Gen. Physics I & II (8 hrs.)

III. General Biology Requirements (17-18 hrs.):

BIOL 150 (or 151, Honors) Principles of Molecular 
& Cellular Biology (4 hrs.)
BIOL 152 (or 153, Honors) Principles of Organismal Biology (4 hrs.)
BIOL 350 Principles of Genetics (3 hrs.)

TWO OF THE FOLLOWING FOUR COURSES

(6-7 hrs.):

BIOL 406 Physiology of Organisms (3 hrs.)
BIOL 416 Cell Structure & Function (3 hrs.)
BIOL 417 Biology of Development (3 hrs.)
BIOL 600 Intro. Biochemistry Lectures (4 hrs.)

IV. Ecology & Evolutionary Biology Requirements (18 hrs.):  

BIOL 412 Evolutionary Biology (3 hrs.)
BIOL 413 History and Diversity of Organisms (3 hrs.)
BIOL 414 Principles of Ecology (3 hrs.)
BIOL 415 Laboratory Methods in Ecology (2 hrs.)
BIOL 550 Introduction to Systematics (3 hrs.)
BIOL 570 Introduction to Biostatistics (3 hrs.)
BIOL 599 Senior Seminar in Ecology & Evolutionary Biology (1 hr.) (must be taken in senior year)

V. Elective and Laboratory Requirements (13 hrs.): BIOL courses numbered 400 or higher which include at least 3 hrs. of laboratory credit and 2 hrs. of a seminar or topics course (BIOL 419, 420, 499, 701). Courses listed above which have not been used to fulfill the above requirements may be used as electives. No more than 3 hrs. of BIOL 423 Non-Lab Independent Study and/or BIOL 424 Independent Study (combined) can be applied towards the elective requirement with no more than 2 hours of BIOL 424 being applied towards the laboratory requirement.

BIOL (___ hrs.)
BIOL (___ hrs.)
BIOL (___ hrs.)
BIOL (___ lab hrs.)
BIOL (___ lab hrs.)
BIOL (___ seminar hrs.)
GENETICS

BACHELOR OF SCIENCE

At least 120 hrs. (of which 45 must be Jr/Sr hrs.—courses numbered 300 or above) must be completed for graduation.

Completing the minimum requirements listed on this sheet will result in 108 overall hrs. and 44 Jr/Sr hrs. Double majors must complete at least 15 hrs. unique to the major.

I. General College Requirements (33 hrs.):

**English (9 hrs.):** ENGL 101 ___; ENGL 102 (or 105) ___; ENGL 203 (or 205, 209, 210, 211)

**Argument & Reason (3 hrs., one of the following):** ___

**COMS 130, 230, PHIL 148, 310**

**Western Civilization (6 hrs.):** HWC 204 (or 114) ___; HWC 205 (or 115) ___

**Principal Course and/or Foreign Language Requirements (No more than one course from each topical subgroup from the principal course list can be applied toward fulfillment of this requirement. See:**

http://www2.ku.edu/~clas/forw/principal_courses.shtml)

**Social Science (3 hrs.) **___; **Humanities (3 hrs.)** ___; **and three additional courses in foreign language, social sciences, or humanities:** ______, _______, _______.

II. General Science Requirements (28-29 hrs.):

___ CHEM 184 Foundations of Chemistry I (5 hrs.)

___ CHEM 188 Foundations of Chemistry II (5 hrs.)

___ CHEM 622 Fund. Organic Chem. (3 hrs.) OR

___ CHEM 624 Organic Chem. I (3 hrs.)

___ CHEM 625 Organic Chemistry I lab (2 hrs.)

___ MATH 121 Calculus I (5 hrs.) OR

___ MATH 115 & MATH 116 Calculus I & II (6 hrs.)

___ PHSX 114 & PHSX 115 Coll. Physics I & II (8 hrs.) OR

___ PHSX 211 & PHSX 212 Gen. Physics I & II (8 hrs.)

*Students planning to enter graduate school (particularly those interested in applying molecular techniques or medical school are advised to also enroll in CHEM 626/627.*

III. General Biology Requirements (24 hrs.):

___ BIOL 150 (or 151, Honors) Principles of Molecular & Cellular Biology (4 hrs.)

___ BIOL 152 (or 153, Honors) Principles of Organismal Biology (4 hrs.)

___ BIOL 412 Evolutionary Biology (3 hrs.)

___ BIOL 416 Cell Structure and Function (3 hrs.)

___ BIOL 570 Introduction to Bioinformatics (3 hrs.)

___ BIOL 600 Introductory Biochemistry (4 hrs.)

___ **ONE OF THE FOLLOWING THREE COURSES (3 hrs.)**

BIOL 400 (or BIOL 401, Honors) Fundamentals of Microbiology (3 hrs.)

BIOL 408 Physiology of Organisms (3 hrs.)

BIOL 417 Biology of Development (3 hrs.)

IV. Genetics Requirements (15 hrs.):

___ BIOL 350 Principles of Genetics (3 hrs.)

___ BIOL 405 Laboratory in Genetics (2 hrs.)

___ BIOL 672 Gene Expression (3 hrs.)

___ BIOL 595 Senior Seminar in Genetics (1 hr.)

(must be taken in senior year)

___ **TWO COURSES FROM THE FOLLOWING LIST (6 HRS.)**

BIOL 512 General Virology (3 hrs.)

BIOL 518 Microbial Genetics (3 hrs.)

BIOL 595 Human Genetics (3 hrs.)

BIOL 611 Molecular Evolution/Systematics (4 hrs.)

BIOL 688 Molecular Biology of Cancer (3 hrs.)

BIOL 692 Developmental Genetics (3 hrs.)

BIOL 743 Population Genetics (3 hrs.)

BIOL 747 Quantitative Genetics (3 hrs.)

BIOL 755 Mechanisms of Development (3 hrs.)

ANTH 340 Human Variation and Evolution (3 hrs.)

ANTH 442 Anthropological Genetics (3 hrs.)

ANTH 652 Population Dynamics (3 hrs.)

V. Elective and Laboratory Requirements (8 hrs.):

BIOL courses numbered 400 or higher, including at least 3 hrs. of lab credit and 2 hrs. of a seminar/topics course (BIOL 419, 420, 499, 701). Courses listed above which have not been used to fulfill the above requirements may be used as electives. No more than 3 hrs. of BIOL 423 Non-Lab Independent Study and/or BIOL 424 Independent Study (combined) can be applied towards the elective requirement with no more than 2 hours of BIOL 424 being applied towards the laboratory requirement.

BIOL ___ (___ hrs.)

BIOL ___ (___ lab hrs.)

BIOL ___ (___ lab hrs.)

BIOL ___ (___ seminar hrs.)

10/10/2011
NEUROBIOLOGY

BACHELOR OF SCIENCE

At least 120 hrs. (of which 45 must be Jr/Sr hrs.—courses numbered 300 or above) must be completed for graduation.

Completing the minimum requirements listed on this sheet will result in 113 overall hrs. and 48 Jr/Sr hrs.

Double majors must complete at least 15 hrs. unique to the major.

I. General College Requirements (33 hrs):

English (9 hrs): ENGL 101__; ENGL 102 (or 105)__;
ENGL 203 (or 205, 209, 210, 211) __
Argument & Reason (3 hrs., one of the following): __
COMS 130, 230, PHIL 148, 310 __
Western Civilization (6 hrs): HWC 204 (or 114) __
HWC 205 (or 115) __

Principal Course and/or Foreign Language Requirements
No more than one course from each topical subgroup from the principal course list can be applied toward fulfillment of this requirement. See:
https://www2.ku.edu/~class/prereqs/principal_courses.shtml

Social Science (3 hrs)__; Humanities (3 hrs)__; and
three additional courses in foreign language, social sciences, or humanities: ___________

Note: Students are encouraged to consider Neuroscience-related courses in Psychology, Speech Language and Hearing, and Applied Behavior Sciences for their distribution requirements.

II. General Science Requirements (31-32 hrs):

____ CHEM 184 Foundations of Chemistry I (5 hrs)
____ CHEM 188 Foundations of Chemistry II (5 hrs)
____ CHEM 624 Organic Chemistry I (3 hrs)
____ CHEM 625 Organic Chemistry I lab (2 hrs)
____ CHEM 626 Organic Chemistry II (3 hrs)
____ MATH 121 Calculus I (5 hrs) OR MATH 115 and
MATH 116 Calculus I & II (6 hrs)
____ PHYS 114, PHYS 115 Coll. Physics I/II (8 hrs) OR
____ PHYS 211 and PHYS 212 Gen. Physics I & II (8 hrs)

III. General Biology Requirements (21-23 hrs):

____ BIOL 150 (or 151, Honors) Principles of Molecular &
Cellular Biology (4 hrs)
____ BIOL 152 (or 153, Honors) Principles of Organismal
Biology (4 hrs)
____ BIOL 350 Introduction to Genetics (3 hrs)
____ BIOL 412 Evolutionary Biology (3 hrs)

____ BIOL 413 Diversity of Organisms OR
____ BIOL 414 Principles of Ecology (3 hrs)
____ BIOL 600 Introductory Biochemistry (4 hrs) OR
____ BIOL 636 Biochemistry I and BIOL 638
Biochemistry II (6 hrs)

IV. Neurobiology Requirements (15-16 hrs):

____ BIOL 416 Cell Structure and Function (3 hrs)
____ BIOL 417 Biology of Development (3 hrs)
____ BIOL 455 Laboratory in Genetics (2 hrs) OR
____ BIOL 426 Cell Biology lab (3 hrs) OR
____ BIOL 427 Developmental Biology Laboratory (2 hrs)
____ BIOL 435 Intro. to Neurobiology (3 hrs)
____ BIOL 590 Advanced Neurobiology (3 hrs)
____ BIOL 599 Senior Seminar in Neurobiology (1 hr)
(must be taken in senior year)

V. Neurobiology Electives (12 hrs):

Select at least three courses from the following
list:

____ BIOL 454 Brain Diseases and Neurological Disorders
____ BIOL 570 Introduction to Biostatistics
____ BIOL 640 Mammalian Physiology (lab 647)
____ BIOL 652 Animal Behavior
____ BIOL 676 Mammalian Neuroanatomy
____ BIOL 672 Gene Expression
____ BIOL 673 Cellular and Molecular Neurobiology
____ BIOL 755 Mechanisms of Development
____ BIOL 775 Chemistry of the Nervous System
____ BIOL 777 Integrative and Developmental Neurobiology

____ Additional electives can be chosen from any
BIOL courses at the 400-level or above.
ORGANISMAL BIOLOGY

BACHELOR OF SCIENCE

At least 120 hrs. (of which 45 must be Jr/Sr hrs.—courses numbered 300 or above) must be completed for graduation.

Completing the minimum requirements listed on this sheet will result in 110 overall hrs. and 46 Jr/Sr hrs.

Double majors must complete at least 15 hrs. unique to the major.

I. General College Requirements (33 hrs.):

   English (9 hrs.): ENGL 101 ___; ENGL 102 (or 105) ___; ENGL 203 (or 205, 209, 210, 211) ___

   Argument & Reason (3 hrs., one of the following): ___
   COMS 110, 230, PHIL 148, 310

   Western Civilization (6 hrs.): HWC 204 (or 114) ___;
   HWC 205 (or 115) ___

   Principal Course and/or Foreign Language Requirements
   (No more than one course from each topical subgroup from the principal course list can be applied toward fulfillment of this requirement. See:
   http://www2.ku.edu/~claus/pawc/principal_courses.shtml):

   Social Science (3 hrs.) ___; Humanities (3 hrs.) ___;
   and three additional courses in foreign language, social sciences, or humanities: ___; ___; ___;

II. General Science Requirements (28-29 hrs.):

   ___ CHEM 184 Foundations of Chemistry I (5 hrs.)
   ___ CHEM 188 Foundations of Chemistry II (5 hrs.)
   ___ CHEM 622 Fund. Organic Chem. (3 hrs.) OR
   ___ CHEM 624 Organic Chem. I (3 hrs.)
   ___ CHEM 625 Organic Chemistry I lab (2 hrs.)
   ___ MATH 121 Calculus I (5 hrs.) OR
   ___ MATH 115 & MATH 116 Calculus I & II (6 hrs.)
   ___ PHYS 114 & PHYS 115 Coll. Physics I & II (8 hrs.) OR
   ___ PHYS 211 & PHYS 212 Gen. Physics I & II (8 hrs.)

III. General Biology Requirements (18 hrs.):

   ___ BIOL 150 (or 151, Honors) Prin. of Molecular & Cellular Biology (4 hrs.)
   ___ BIOL 152 (or 153, Honors) Principles of Organismal Biology (4 hrs.)
   ___ BIOL 350 Principles of Genetics (3 hrs.)
   ___ BIOL 412 Evolutionary Biology (3 hrs.)
   ___ BIOL 600 Introductory Biochemistry (4 hrs.)

IV. Organismal Biology Requirements (21 hrs.):

   ___ BIOL 408 Physiology of Organisms (3 hrs.)
   ___ BIOL 409 Physiology of Organisms Lab. (2 hrs.)
   ___ BIOL 413 History/Diversity of Organisms (3 hrs.)
   ___ BIOL 599 Senior Seminar, Organismal Biol. (1 hr.)
   (must be taken in senior year)

   One of the following courses (3 hrs.):
   BIOL 416 Cell Structure and Function (3 hrs.)
   BIOL 414 Principles of Ecology (3 hrs.)
   BIOL 550 Intro. to Systematics (3 hrs.)

At least one course from each of the following three groups:
(9 hrs.)

   Development and Morphology Group:
   BIOL 417 Development/Biolog.; BIOL 440 Development of Animals
   BIOL 510 Comparative Vertebrate Anatomy; BIOL 528 (or BIOL 708)
   External Morphology of Insects; BIOL 545 Evolutionary Development

   Function Group:
   BIOL 435 Introduction to Neurobiology; BIOL 503 Immunology; BIOL 506
   Pathogenic Micr. Microbiology; BIOL 526 (or BIOL 716) Insect
   Physiology/Invertebrate Morphology; BIOL 660 Ecological Plant Physiology;
   BIOL 644 Comparative Animal Physiology; BIOL 680 Mammalian
   Physiology; BIOL 652 Comparative Animal Behavior; BIOL 657 Chemical
   Communications in Sex, Feeding & Fighting; BIOL 673 Cellular & Molecular
   Neurobiology

   Diversity Group:
   ANTH 440 History of Primate; BIOL 406 Fundamentals of Microbiology (or
   BIOL 405 Honors); BIOL 494 Introduction to Taxonomy; BIOL 500
   Biology of Insects; BIOL 505 Social Insects; BIOL 509 Biology of Spiders;
   BIOL 512 General Vertebrate Biology; BIOL 521 (or BIOL 741) Insect Systematics;
   BIOL 529 (or BIOL 709) Invertebrate Morphology; BIOL 553 Biology of Fungi;
   BIOL 540 General Invertebrate Zoology; BIOL 583 (or BIOL 785)
   Herpetology; BIOL 592 (or BIOL 792) Ichthyology; BIOL 593 Ornithology;
   BIOL 600 Systematic Botany; BIOL 610 Plant Systematics; BIOL 613 Biology of
   Invertebrates; BIOL 622 Invertebrate Paleontology; BIOL 640
   Biology-Evolution of Fossil Plants

V. Elective/Laboratory Requirements (10 hrs.):

   BIOL courses numbered 400 or higher, including at least 2 hrs. of
   lab credit and 1 hr. of a seminar/topics course (BIOL 419, 420, 499,
   701), Courses listed above which have not been used to fulfill the above
   requirements may be used as electives. No more than 3 hrs. of BIOL 423
   Non-Lab Independent Study and/or BIOL 424 Independent Study (combined)
   can be applied towards the elective requirement with no more than 2 hours of
   BIOL 424 being applied towards the laboratory requirement.

   BIOL ___ (___ hrs.)
   BIOL ___ (___ hrs.)
   BIOL ___ (___ hrs.)
   BIOL ___ (___ lab hrs.)
   BIOL ___ (___ seminar hrs.)
KU Undergraduate Biology (www.kuub.ku.edu)

For students entering in/after Fall 2009

TEACHING BIOLOGY

BACHELOR OF SCIENCE

At least 120 hrs. (of which 45 must be Jr/Sr hrs.—courses numbered 300 or above) must be completed for graduation.

Completing the minimum requirements listed on this sheet will result in 119 overall hrs. and 53 Jr/Sr hrs.

Double majors must be completed at least 15 hrs. unique to the major.

I. General College Requirements (33 hrs.):

- English (9 hrs): ENGL 101, ENGL 102 (or 105) \(^\star\)
- ENGL 203 (or 205, 209, 210, 211)
- Argument & Reason (3 hrs, one of the following): PHIL 148, 310
- Western Civilization (6 hrs): HWC 204 (or 114) \(^\star\) and HWC 205 (or 115) \(^\star\)

Principal Course and/or Foreign Language Requirements (No more than one course from each topical subgroup from the principal course list can be applied toward fulfillment of this requirement. See:

- HIST 136/137 Perspectives on Sci & Math. (3 hrs.) \(^\star\)
- Social Science (3 hrs.) \(^\star\); and three additional courses in foreign language, social sciences, or humanities: \(\ldots\) \(^\star\)

II. General Science Requirements (28-29 hrs.):

- CHEM 184 Foundations of Chemistry I (5 hrs.)
- CHEM 188 Foundations of Chemistry II (5 hrs.)
- CHEM 622 Fund. Organic Chemistry (3 hrs.) \(^\star\)
- CHEM 624 Organic Chemistry I (3 hrs.)
- CHEM 625 Organic Chemistry I lab (2 hrs.)
- MATH 121 Calculus I (5 hrs.) \(^\star\)
- MATH 115 & MATH 116 Calculus I & II (6 hrs.) \(^\star\)
- PHYS 114 & PHSX 115 Col. Physics I & II (8 hrs.) \(^\star\)
- PHYS 211 & PHSX 212 General Physics I & II (8 hrs.)

III. Biology Core Requirements (30-31 hrs.):

- BIOL 150 (or 151, Honors) Principles of Molecular & Cellular Biology (4 hrs.)
- BIOL 152 (or 153, Honors) Principles of Organisal Biology (4 hrs.)
- BIOL 350 Introduction to Genetics (3 hrs.)
- BIOL 412 Evolutionary Biology (3 hrs.)
- BIOL 414 Principles of Ecology (3 hrs.)
- BIOL 416 Cell Structure & Function (3 hrs.)
- BIOL 598 Research Methods (3 hrs.)
- BIOL 599 Senior Seminar in Biology (1 hr.) \(\text{(must be taken in senior year)}\)

IV. Biology Elective and Laboratory Requirements (7 hrs.): BIOL courses numbered 400 or higher which include at least 4 hrs. of laboratory credit.

Courses listed above which have not been used to fulfill the above requirements may be used as electives. No more than 3 hrs. of BIOL 423 Non-Lab Independent Study and/or BIOL 424 Independent Study (combined) can be applied towards the elective requirement with no more than 2 hours of BIOL 424 being applied towards the laboratory requirement.

- BIOL \(_{\ldots}\) (\(_\ldots\) hrs.)
- BIOL \(_{\ldots}\) (\(_\ldots\) lab hrs.)
- BIOL \(_{\ldots}\) (\(_\ldots\) lab hrs.)

V. Education Requirements (21 hrs.)

- LA&S 290 Approaches to Teaching Science and Mathematics I (1 hr.)
- LA&S 291 Approaches to Teaching Science and Mathematics II (1 hr.)

School of Education courses:

- C&T 360 Knowing/Learning in Math & Science (3 hrs.)
- C&T 366 Classroom Interact in Math & Science (3 hrs.)
- C&T 448 Reading Across the Curriculum (3 hrs.)
- C&T 460 Project-Based Instr in Math & Science (3 hrs.)
- C&T 500 Student Teaching (6 hrs.)
- C&T 598 Special Topics Seminar (1 hr.)

10/10/2011
MICROBIOLOGY

BACHELOR OF ARTS

At least 120 hrs. (of which 45 must be Jr/Sr hrs.—courses numbered 300 or above) must be completed for graduation.

Completing the minimum requirements listed on this sheet will result in 119 overall hrs. and 35 Jr/Sr hrs.

Double majors must complete at least 15 hrs. unique to the major.

I. General College Requirements (58 hrs.):

*English* (9 hrs.): ENGL 101; ENGL 102 (or 105) ___;
ENGL 203 (or 205, 209, 210, 211) ___

*Argument & Reason* (3 hrs., one of the following): ___
COMS 130, 230, PIHL 148, 310

*Western Civilization* (6 hrs.): HWC 204 (or 114) ___;
HWC 205 (or 115) ___

Principal Course Distribution Requirements (see:
http://www2.ku.edu/~class/pawc/principal_courses.shtml)

*Humanities* (9 hrs.):
(HI) ________, (HL) ________, (HR) ________

*Social Science* (9 hrs.):
(SC) ________, (SI) ________, (SP) ________

*Non-Western Culture* (one course): ___ (see:
http://www2.ku.edu/~class/pawc/nonwest_culture_courses.shtml)

*Foreign Language* (16-20 hrs. or proficiency):

Principal course in *Earth Sciences* or *Mathematical Sciences*
(3 hrs.) (in addition to MATH 115 or 121) or BIOL 570 ___

II. General Science Requirements (34-35 hrs.):

BIOL 150 (or BIOL 121) Principles of Molecular &
Cellular Biology (4 hrs.)

BIOL 350 Principles of Genetics (3 hrs.)

CHEM 184 Foundations of Chemistry I (5 hrs.)

CHEM 188 Foundations of Chemistry II (5 hrs.)

CHEM 622 Fund. Organic Chemistry (3 hrs.) OR
CHEM 624 Organic Chemistry I (3 hrs.)

CHEM 625 Organic Chemistry Lab (2 hrs.)

MATH 115 & MATH 116 Calculus I (6 hrs.) OR
MATH 121 Calculus I (5 hrs.)

PHSX 114 & PHSX 115 Col. Physics I/II (8 hrs.) OR
PHSX 211 & PHSX 212 General Physics I & II (8 hrs.)

Note: Students planning graduate study are advised to complete a year of Organic Chemistry (CHEM 624, 625, 626, 627) and a year of Biochemistry (BIOL 636, 637, 638).

III. Microbiology Core Requirements (9-10 hrs.):

BIOL 400 Fundamentals of Microbiology (3 hrs.) (or
BIOL 401, Honors)

BIOL 402 Fundamentals of Microbiology Lab (2 hrs.)

One of the following two courses:

BIOL 516 Microbial Physiology (3 hrs) OR
BIOL 600 Introductory Biochemistry (4 hrs.)

BIOL 599 Senior Seminar – Current Progress in
Microbiology (1 hr.) (must be taken in senior year)

IV. Microbiology Electives and Laboratory
Requirements (15 hrs.):

Fifteen hours of Microbiology courses, including three lab
courses, selected from the following:

BIOL 503 Immunology (3 hrs.)

BIOL 504 Immunology Lab (2 hrs.)

BIOL 506 Pathogenic Microbiology (3 hrs.)

BIOL 507 Pathogenic Microbiology Lab (2 hrs.)

BIOL 512 General Virology (3 hrs.)

BIOL 513 Virology Laboratory (2 hrs.)

BIOL 517 Microbial Physiology Lab (2 hrs.)

BIOL 518 Microbial Genetics (3 hrs.)

BIOL 519 Microbial Genetics Lab (2 hrs.)

V. Biology Electives Requirements (3 hrs.):

Biology courses numbered 409 or higher to be selected in
consultation with a microbiology advisor.

BIOL ___ (___ hrs.)

10/10/2011
KU Undergraduate Biology (www.kuub.ku.edu)

MICROBIOLOGY

BACHELOR OF SCIENCE

At least 120 hrs. (of which 45 must be Jr/Sr hrs.—courses numbered 300 or above) must be completed for graduation.

Completing the minimum requirements listed on this sheet will result in 117 overall hrs. and 54 Jr/Sr hrs.

Double majors must complete at least 15 hrs. unique to the major.

I. General College Requirements (33 hrs.):

English (9 hrs.): ENGL 101 ___; ENGL 102 (or 105) ___;
ENGL 203 (or 205, 209, 210, 211) ___

Argument & Reason (3 hrs., one of the following): ___
COMS 130, 230, PHIL 148, 310

Western Civilization (6 hrs.): HWC 204 (or 114) ___;
HWC 205 (or 115) ___

Principal Course and/or Foreign Language Requirements
(No more than one course from each topical subgroup from
the principal course list can be applied toward fulfillment of
this requirement. See:
http://www2.ku.edu/~clasus/psw/ principal_courses.shtml):

Social Science (3 hrs.) ____;
Humanities (3 hrs.) ____;
and three additional courses in foreign language, social
sciences, or humanities: ______, ______, ______, ______.

II. General Science Requirements (49-50 hrs.):

Biol 150 Principles of Molecular and Cellular
Biology (4 hrs.) (or BIOL 151)

Biol 350 Principles of Genetics (3 hrs.)

Chem 184 Foundations of Chemistry I (5 hrs.)

Chem 188 Foundations of Chemistry II (5 hrs.)

Chem 624 Organic Chemistry I (3 hrs.)

Chem 625 Organic Chemistry I lab (2 hrs.)

Chem 626 Organic Chemistry II (3 hrs.)

Chem 627 Organic Chemistry II lab (2 hrs.)

Phsx 114 & PHSX 115 Coll. Physics I & II (8 hrs.) OR

Phsx 211 & PHSX 212 General Physics I & II (8 hrs.)

Math 121 Calculus I (5 hrs.) OR

Math 115 & Math 116 Calculus I & II (6 hrs.)

Biol 570 Statistics (3 hrs.) OR

Math 365 (3 hrs.) OR Psych 210 (3 hrs.)

Biol 636 Biochemistry I (3 hrs.)

Biol 638 Biochemistry II (3 hrs.)

III. Microbiology Requirements (29 hrs.):

Biol 400 Fundamentals of Microbiology (3 hrs.)
(or Biol 401, Honors)

Biol 402 Fundamentals of Microbiology Laboratory (2 hrs.)

Biol 416 Cell Structure and Function (3 hrs.)

Biol 503 Immunology (3 hrs.)

Biol 504 Immunology Laboratory (2 hrs.)

Biol 506 Pathogenic Microbiology (3 hrs.)

Biol 507 Pathogenic Microbiology Laboratory (2 hrs.)

Biol 512 General Virology (3 hrs.)

Biol 513 Virology Laboratory (2 hrs.)

Biol 518 Microbial Genetics (3 hrs.)

Biol 519 Microbial Genetics Laboratory (2 hrs.)

Biol 599 Senior Seminar – Current Progress in Microbiology (1 hr.) (must be taken in senior year)

IV. Elective Requirements (6 hrs.):

Biology courses numbered 400 or higher to be selected in consultation with a microbiology advisor.

Biol ___ (___ hrs.)

Biol ___ (___ hrs.)

Biol ___ (___ hrs.)
MOLECULAR BIOSCIENCES

BACHELOR OF SCIENCE

At least 120 hrs. (of which 45 must be Jr/Sr hrs.—courses numbered 300 or above) must be completed for graduation.

Completing the minimum requirements listed on this sheet will result in 109 overall hrs. and 42 Jr/Sr hrs.

Double majors must complete at least 15 hrs. unique to the major.

I. General College Requirements (33 hrs.):

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<tr>
<th>Course</th>
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<td><strong>English</strong></td>
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<td>ENGL 101</td>
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<td>ENGL 102 or ENGL 105</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 203</td>
<td>3</td>
</tr>
<tr>
<td>Argument &amp; Reason</td>
<td>1</td>
</tr>
<tr>
<td><strong>COMS</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>PHIL</strong></td>
<td>3</td>
</tr>
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<td><strong>WIVN</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>HWC</strong></td>
<td>3</td>
</tr>
</tbody>
</table>

Principal Course and/or Foreign Language Requirements

No more than one course from each topical subgroup from the principal course list can be applied toward fulfillment of this requirement. See:

http://www2.ku.edu/class/paws/principal_courses.shtml

Social Science (3 hrs.) __________; Humanities (3 hrs.) __________; and three additional courses in foreign language, social sciences, or humanities: __________, __________, __________.

II. General Science Requirements (36-37 hrs.):

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CHEM</strong></td>
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</tr>
<tr>
<td>CHEM 184 Foundations of Chemistry I</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 188 Foundations of Chemistry II</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 624 Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 625 Organic Chemistry I lab</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 626 Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 627 Organic Chemistry II lab</td>
<td>2</td>
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<tr>
<td><strong>MATH</strong></td>
<td></td>
</tr>
<tr>
<td>MATH 115 and MATH 116 Calculus I/II (6 hrs.)</td>
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<tr>
<td>MATH 121 Calculus I</td>
<td>5</td>
</tr>
<tr>
<td><strong>BIOL</strong></td>
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</tr>
<tr>
<td>BIOL 570 Statistics</td>
<td>3</td>
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<tr>
<td>MATH 365 OR PSYC 210</td>
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<tr>
<td><strong>PHSX</strong></td>
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<td>PHSX 114 and PHSX 115 Coll. Physics I/II</td>
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<td>PHSX 211 and PHSX 212 General Physics I/II</td>
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III. Molecular Biosciences Requirements (29 hrs.):

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<th>Course</th>
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<tr>
<td><strong>BIOL</strong></td>
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<td>BIOL 150 or BIOL 151, Honors) Principles of</td>
<td>4</td>
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<tr>
<td>Molecular &amp; Cellular Biology</td>
<td></td>
</tr>
<tr>
<td>BIOL 152 or BIOL 153, Honors) Principles of</td>
<td>4</td>
</tr>
<tr>
<td>Organismal Biology</td>
<td></td>
</tr>
<tr>
<td>BIOL 350 Principles of Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 400 Fundamentals of Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 402 Fundamentals of Microbiology Lab</td>
<td>2</td>
</tr>
<tr>
<td>BIOL 405 Laboratory in Genetics</td>
<td>2</td>
</tr>
<tr>
<td>BIOL 416 Cell Structure and Function</td>
<td>3</td>
</tr>
</tbody>
</table>

IV. General Biology Electives, Seminar and Laboratory Requirements (11 hrs.):

**BIOL** courses numbered 400 or higher, including at least 2 hrs. of lab credit and 2 hrs. of a seminar/topics course (BIOL 419, 420, 701). No more than 3 hrs. of BIOL 423 Non-Lab Independent Study and/or BIOL 424 Independent Study (combined) can be applied towards the elective requirement with no more than 2 hours of BIOL 424 being applied towards the laboratory requirement.

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BIOL ____ (___ hrs.)</td>
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<td>BIOL ____ (___ yrs.)</td>
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<tr>
<td>BIOL ____ (___ lab hrs.)</td>
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<tr>
<td>BIOL ____ (___ lab hrs.)</td>
<td></td>
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<tr>
<td>BIOL ____ (___ seminar hrs.)</td>
<td></td>
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</tbody>
</table>

* This degree is offered at the EDWARDS campus ONLY.

Junior/Senior level BIOL courses for this degree must be completed at the Edwards campus.

Major Declaration Intent forms for Molecular Biosciences must be signed by an Edwards campus advisor. Contact Dan Mueller at 913-897-8659 (x4-8659) for more information.

10/19/2011
Appendix II. KU Undergraduate Biology organizational chart, 2011.