

**EXECUTIVE COMMITTEE
COLLEGE OF NATURAL AND AGRICULTURAL SCIENCES
REPORT TO THE RIVERSIDE DIVISION
MAY 26, 2020**

To be adopted:

Proposed Changes to Biochemistry, BS and BA

Present:

Proposed:

Major

Major

The three emphases areas within the Biochemistry major are Chemistry, Biology, and Medical Sciences. The Biology and Chemistry emphases are for students interested in postgraduate education or employment in the basic areas of the discipline of Biochemistry. The goal of the Medical Sciences emphasis is to prepare students for admission to postbaccalaureate education in the health professions. The Biology, Chemistry, and Medical Sciences emphases focus on the development of laboratory and critical thinking skills, and hands-on laboratory experience. In addition, participation in an independent research project (BCH 197) or research tutorial (BCH 190), carried out under the supervision of a faculty member, is encouraged. Internships in industry (~~BCH 198-I~~) are also available, and often lead to valuable job experience and employment opportunities.

The three emphases areas within the Biochemistry major are Chemistry, Biology, and Medical Sciences. The Biology and Chemistry emphases are for students interested in postgraduate education or employment in the basic areas of the discipline of Biochemistry. The goal of the Medical Sciences emphasis is to prepare students for admission to postbaccalaureate education in the health professions. The Biology, Chemistry, and Medical Sciences emphases focus on the development of laboratory and critical thinking skills, and hands-on laboratory experience. In addition, participation in an independent research project (BCH 197) or research tutorial (BCH 190), carried out under the supervision of a faculty member, is encouraged. Internships in industry (BCH 198I) are also available, and often lead to valuable job experience and employment opportunities.

The department offers both B.A. and B.S. degrees. The major and emphasis requirements are the same for both, and most students choose the B.S. degree. The B.A. degree requires 12 additional units of Humanities and Social Sciences courses, and 16 units or a course 4 equivalency level of a foreign language (see College Breadth Requirements).

(No Change)

Note: A maximum of 12 units of 190-199 courses may be counted toward the 180 unit graduation requirement. All courses used towards the Biochemistry major requirements must be taken for letter grades.

(No Change)

Transfer Students

Transfer students ~~majoring~~ in Biochemistry must ~~complete at least three of the following full-year sequences, which must include first-year calculus and general chemistry:~~

1. ~~First-year~~ calculus, equivalent to MATH 009A, MATH 009B, ~~MATH 0046~~
2. General chemistry, equivalent to CHEM 001A, CHEM 001B, CHEM 001C, ~~CHEM 011A, CHEM 011B, CHEM 011C~~
3. ~~Organic~~ chemistry (~~must be completed with a minimum grade of "B" in each term~~)
4. ~~General~~ biology, equivalent to BIOL 005A, BIOL 051A, ~~and BIOL 005B (and BIOL 005C, if available)~~

5. General physics (calculus-based) equivalent to PHYS 002A, PHYS 002B, PHYS 002C or PHYS 040A, PHYS 040B, PHYS 040C

Students must have a minimum grade point average of 2.70 in transferable college courses.

University Requirements

See Undergraduate Studies section.

College Requirements

See College of Natural and Agricultural Sciences, Colleges and Programs section. Some of the following requirements for the major may also fulfill some of the college's breadth requirements. Consult with a department advisor for course planning.

Major Requirements

The major requirements and the emphasis requirements are the same for the B.A. and the

Transfer students desiring to major in Biochemistry must have completed:

1. Two quarters of calculus, equivalent to MATH 009A and MATH 009B
2. A year of general chemistry, equivalent to CHEM 001A, CHEM 011A, CHEM 001B, CHEM 011B, CHEM 001C, CHEM 011C
3. A year of organic chemistry, equivalent to CHEM 008A, CHEM 081A, CHEM 008B, CHEM 081B, CHEM 008C, CHEM 081C
4. A course in general biology, equivalent to BIOL 005A and BIOL 051A

Strongly recommended but not required for admission to the major are:

1. General Biology, equivalent to BIOL 005B and BIOL 005C

2 One quarter of Ordinary Differential Equations, equivalent to MATH 046

3. General physics (calculus-based) equivalent to PHYS 002A, PHYS 002B, PHYS 002C or PHYS 040A, PHYS 040B, PHYS 040C

(No Change)

(No Change)

(No Change)

(No Change)

B.S. degree in Biochemistry. Choose one emphasis. All upper-division courses presume completion of the life sciences core curriculum.

Continuation in the major requires that the student maintains cumulative and upper division/science GPAs of 2.00 or higher, a GPA of 2.00 or higher in each academic quarter, and makes adequate progress in the major with no more than 16 units of repeated courses. Adequate progress in the major is defined as (a) earning no grade lower than a "C-" in any required lower division mathematics or science course, ~~STAT 100A, CHEM 12A, CHEM 12B, CHEM 12C,~~ or any upper division BCH course, and (b) completing ~~MATH 9B and CHEM 1A~~ by the end of the Fall Quarter of the second year of residence and ~~BCH 110A, BCH 110B, and BCH 110C~~ by the end of the third year of residence. Freshmen must also complete ~~BCH 95~~ with a grade of "S" during their first year of residence. Freshmen in the Medical Science Emphasis must also complete ~~BCH 96~~ with a grade of "S" during their first year of residence. A student who does not meet these adequate progress standards will be discontinued from the major. In addition, a student who receives a grade of "D+" or lower in any two of the courses in (A) on the first attempt, or in any one of these courses in each of two attempts, will be discontinued from the major. Students who receive a grade lower than "B-" in ~~BIOL 5A or CHEM 12A~~ are strongly encouraged to complete BCH 100 during their second year of residence to better prepare themselves for ~~BCH 110A, BCH 110B, and BCH 110C.~~

Biology Emphasis

1. Lower-division requirements (71 units)

- a) BCH 095 or equivalent, BCH 015
- b) BIOL 005A, BIOL 05LA or BIOL 020, BIOL 005B, BIOL 005C
- c) CHEM 001A, CHEM 001B, CHEM 001C, CHEM 01LA, CHEM 01LB, CHEM 01LC, CHEM 008A and CHEM 08LA or CHEM 08HA and CHEM 8HLA or CHEM 12A, CHEM 008B and CHEM

Continuation in the major requires that the student maintains cumulative and upper division/science GPAs of 2.00 or higher, a GPA of 2.00 or higher in each academic quarter, and makes adequate progress in the major with no more than 16 units of repeated courses. Adequate progress in the major is defined as (a) earning no grade lower than a "C-" in any required lower division mathematics or science course, STAT 100A, CHEM 008A, CHEM 08LA, CHEM 008B, CHEM 08LB, CHEM 008C, CHEM 08LC, or any upper division BCH course, and (b) completing MATH 009B and CHEM 001A by the end of the Fall Quarter of the second year of residence and BCH 110A or BCH 110HA, and BCH 110B or BCH 110HB, by the end of the third year of residence. Freshmen must also complete BCH 095 with a grade of "S" during their first year of residence. Freshmen in the Medical Science Emphasis must also complete BCH 096 with a grade of "S" during their first year of residence. A student who does not meet these adequate progress standards will be discontinued from the major. In addition, a student who receives a grade of "D+" or lower in any two of the courses in (A) on the first attempt, or in any one of these courses in each of two attempts, will be discontinued from the major. Students who receive a grade lower than "B-" in BIOL 005A or CHEM 008A are strongly encouraged to complete BCH 100 during their second year of residence to better prepare themselves for BCH 110A or BCH 110HA, BCH 110B or BCH 110HB, and BCH 110C or BCH 110HC.

(No Change)

(No Change)

- c) CHEM 001A, CHEM 01LA, CHEM 001B, CHEM 01LB, CHEM 001C, CHEM 01LC

~~08LB or CHEM 08HB and CHEM 8HLB
or CHEM 12B, CHEM 008C and CHEM
08LC or CHEM 08HC and CHEM 8HLC
or CHEM 12C~~

~~d) MATH 007A or MATH 009A, MATH
007B or MATH 009B, MATH 046~~

~~e) PHYS 002A, PHYS 002B, PHYS 002C,
PHYS 02LA, PHYS 02LB, PHYS 02LC~~

d) CHEM 008A and CHEM 08LA or CHEM
08HA and CHEM 8HLA, CHEM 008B and
CHEM 08LB or CHEM 08HB and CHEM
8HLB, CHEM 008C and CHEM 08LC or
CHEM 08HC and CHEM 8HLC

e) MATH 007A or MATH 009A, MATH
007B or MATH 009B, MATH 046

f) PHYS 002A, PHYS 02LA, PHYS 002B,
PHYS 02LB, PHYS 002C, PHYS 02LC

2. Upper-division requirements (45-46 units)

a) BCH 110A, BCH 110B, BCH 110C,
BCH 162, BCH 184

b) At least 3 units from BCH 111, BCH
120, BCH 153/BIOL 153/BPSC 153,
BCH 180 (E-Z), BCH 183/BPSC 183,
BCH 186, BCH 187, BCH 210, BCH
211, BCH 212

c) BIOL 102

d) CHEM 109 or CHEM 110A

e) STAT 100A

f) Choose two biological science courses
from the following:

(1) BCH 111, BCH 120, BCH 153/BIOL
153/BPSC 153, BCH 180 (E-Z), BCH
183/BPSC 183, BCH 186, BCH 187,
BCH 210, BCH 211, BCH 212

(2) BIOL 105, BIOL 108, BIOL 114, BIOL
117, BIOL 119, BIOL 121/MCBL 121,
BIOL 121L/MCBL 121L, BIOL 123/
MCBL 123/PLPA 123, BIOL 124/
MCBL 124, BIOL 128/CBNS 128,
BIOL 151, BIOL 155/BPSC 155,
BIOL 157, BIOL 159/NEM 159, BIOL
160, BIOL 161A, BIOL 161B, BIOL
171, BIOL 171L, BIOL 173/ENTM
173, BIOL 175

(3) BIOL 104/BPSC 104, BIOL 132/
BPSC 132, BIOL 143/BPSC 143,
BIOL 148/BPSC 148, BIOL 155/
BPSC 155, BPSC 135

(4) BIOL 100/ENTM 100, BIOL 173/
ENTM 173, ENTM 128

(5) CBNS 101, CBNS 106, CBNS 116,
CBNS 120/PSYC 120, CBNS 120L/

a) BCH 110A or BCH 110HA, BCH 110B or
BCH 110HB, BCH 110C or BCH 110HC,
BCH 162, BCH 184

(No Change)

(No Change)

(No Change)

(No Change)

(No Change)

(No Change)

(No Change)

(3) BIOL 104/BPSC 104, BPSC 109/CBNS 109,
BIOL 132/ BPSC 132, BIOL 143/BPSC 143,
BIOL 148/BPSC 148, BIOL 155/BPSC 155,
BPSC 135, BPSC 149

(No Change)

(5) CBNS 101, CBNS 106, CBNS 116,
CBNS 120/PSYC 120, CBNS 120L/

- PSYC 120L, CBNS 124/PSYC 124,
CBNS 125/PSYC 125, CBNS 150/
ENTX 150, CBNS 169
- (6) ENSC 100
- (7) ENTX 101, CBNS 150/ENTX 150
3. **BCH 190 or BCH 197 are available as elective courses.** Enrollment requires upper division standing and written permission of the supervising faculty member. No more than 9 units of courses numbered 190-199 may be counted towards the major.

- PSYC 120L, CBNS 124/PSYC 124,
CBNS 125/PSYC 125, CBNS 150/
ENTX 150, CBNS 165, CBNS 169
- (No Change)
- (No Change)
- (No Change)
- (No Change)

Chemistry Emphasis

1. Lower-division requirements (76 units)

- a) BCH 095 or equivalent, BCH 015 (No Change)
- b) BIOL 005A, BIOL 05LA or BIOL 020, BIOL 005B, BIOL 005C (No Change)
- c) CHEM 001A, CHEM 001B, CHEM 001C, CHEM 01LA, CHEM 01LB, CHEM 01LC, ~~CHEM 005, CHEM 008A and CHEM 08LA or CHEM 08HA and CHEM 8HLA or CHEM 12A, CHEM 008B and CHEM 08LB or CHEM 08HB and CHEM 8HLB or CHEM 12B, CHEM 008C and CHEM 08LC or CHEM 08HC and CHEM 8HLC or CHEM 12C~~ c) CHEM 001A, CHEM 01LA, CHEM 001B, CHEM 01LB, CHEM 001C, CHEM 01LC
- d) MATH 007A or MATH 009A, MATH 007B or MATH 009B, MATH 046 d) CHEM 008A and CHEM 08LA or CHEM08HA and CHEM 8HLA, CHEM 008B and CHEM 08LB or CHEM 08HB and CHEM 8HLB, CHEM 008C and CHEM 08LC or CHEM 08HC and CHEM 8HLC
- e) PHYS 002A, PHYS 002B, PHYS 002C, ~~PHYS 02LA, PHYS 02LB, PHYS 02LC~~ e) MATH 007A or MATH 009A, MATH 007B or MATH 009B, MATH 046
- f) PHYS 002A, PHYS 02LA, PHYS 002B, PHYS 02LB, PHYS 002C, PHYS 02LC

2. Upper-division requirements (45-46 units)

- a) BCH 110A, BCH 110B, BCH 110C, BCH 162, BCH 184 a) BCH 110A or BCH 110HA, BCH 110B or BCH 110HB, BCH 110C or BCH 110HC, BCH 162, BCH 184
- b) At least 3 units from BCH 111, BCH 120, BCH 153/BIOL 153/BPSC 153, BCH 180 (E-Z), BCH 183/BPSC 183, BCH 186, BCH 187, BCH 210, BCH 211, BCH 212, BIOL 119 b) At least 3 units from BCH 111, BCH 120, BCH 153/BIOL 153/BPSC 153, BCH 180 (E-Z), BCH 183/BPSC 183, BCH 186, BCH 187, BCH 210, BCH 211, BCH 212, BIOL 119, BPSC 109/CBNS 109, BPSC 149
- c) BIOL 102 (No change)
- d) CHEM 109 or CHEM 110A (No change)
- e) STAT 100A (No change)

f) Two courses from CHEM 110B, CHEM 113, CHEM 125, CHEM 150A, CHEM 150B, CHEM 166 (Other graduate courses may be substituted by students with a GPA of 3.00 or better with permission of the instructor and the faculty advisor.) (No change)

3. **BCH 190 or BCH 197 are available as elective courses.** Enrollment requires written permission of the supervising faculty member. No more than 9 units of courses numbered 190-199 may be counted towards the major. (No Change)

Medical Sciences Emphasis

1. Lower-division requirements (69 units)

a) BCH 095 or equivalent, BCH 015 (No Change)

b) BCH 096, BCH 098I (No Change)

c) BIOL 005A, BIOL 05LA or BIOL 020 BIOL 005B, BIOL 005C (No Change)

d) CHEM 001A, CHEM 001B, CHEM 001C, ~~CHEM 01LA, CHEM 01LB, CHEM 01LC, CHEM 008A and CHEM 08LA or CHEM 08HA and CHEM 8HLA~~ d) CHEM 001A, CHEM 01LA, CHEM 001B, CHEM 01LB, CHEM 001C, CHEM 01LC

~~or CHEM 12A, CHEM 008B and CHEM 08LB or CHEM 08HB and CHEM 8HLB or CHEM 12B, CHEM 008C and CHEM 08LC or CHEM 08HC and CHEM 8HLC or CHEM 12C~~ e) CHEM 008A and CHEM 08LA or CHEM 08HA and CHEM 8HLA, CHEM 008B and CHEM 08LB or CHEM 08HB and CHEM 8HLB, CHEM 008C and CHEM 08LC or CHEM 08HC and CHEM 8HLC

e) MATH 007A or MATH 009A, MATH 007B or MATH 009B f) MATH 007A or MATH 009A, MATH 007B or MATH 009B

~~φ) PHYS 002A, PHYS 002B, PHYS 002C, PHYS 02LA, PHYS 02LB, PHYS 02LC~~ g) PHYS 002A, PHYS 02LA, PHYS 002B, PHYS 02LB, PHYS 002C, PHYS 02LC

2. Upper-division requirements (45-46 units)

a) BCH 110A, BCH 110B, BCH 110C, BCH 120, BCH 162, BCH 184 a) BCH 110A, BCH 110HA, BCH 110B, BCH 110HB, BCH 110C, BCH 110HC, BCH 120, BCH 162, BCH 184

b) BIOL 102 (No Change)

c) CHEM 109 or CHEM 110A (No Change)

d) CBNS 101 (No Change)

e) STAT 100A (No Change)

f) At least 3 units from BCH 183/BPSC 183, BIOL 119, BIOL 121, BIOL 161A, BIOL 161B, BIOL 171, CBNS 106, CBNS 150/ENTX 150. f) At least 3 units from BCH 183/BPSC 183, BIOL 119, BIOL 121, BIOL 128/CBNS 128, BIOL 161A, BIOL 161B, BIOL 171, BPSC 109/CBNS 109, BPSC 149, CBNS 106, CBNS 120/PSYC 120, CBNS 150/ENTX 150, CBNS 165, CBNS 169

Graduate and upper-division courses can be substituted with permission of the instructor and the faculty advisor. Graduate courses require a GPA of 3.0 or greater in the sciences. (No Change)

Students should be aware that CHEM 005 is often a requirement for admission to professional schools (No Change)

Justification:

- (1) Entering transfer students must complete BCH 110A and BCH 110B during their first year at UCR if they are to graduate in two years. Students transferring to UCR *without* a year of organic chemistry cannot complete BCH 110A and BCH 110B until their second year and, therefore, are unable to graduate until the end of their third year. The proposed change insures that entering transfer students have completed one year of organic chemistry before enrolling. Currently, one year of organic chemistry is only an option. Because MATH 046 is required for the Biology and Chemistry Emphases, but not for the Medical Sciences Emphasis, this course has been relocated from “required” to “strongly recommended.”
- (2) Added BCH 110 Honors equivalents to BCH 110A, BCH 110B, and BCH 110C courses. Removed CHEM 12A, B, and C because they have been discontinued. Changed the order of PHYS courses to be consistent with how other lecture/lab courses are listed within the requirements. Added leading zeros to course numbers where needed.
- (3) Deleted requirement that BCH 110C be completed during 3rd year of residence because, now that BCH 110A, BCH 110B, and BCH 110C are each offered during two academic quarters (BCH 110A in FW, BCH 110B in WS, and BCH 110C in SF), students can complete BCH 110C during the first quarter of their fourth year and still graduate in four years.
- (4) BIOL 128/CBNS 128 is already listed as an approved elective for our Biological Sciences students but not for our Medical Science Emphasis students.
- (5) BPSC 109/CBNS-109 and BPSC 149. These two new courses would be appropriate electives for all three emphases in Biochemistry.
- (6) CBNS 120/PSYC 120 is already listed as an approved elective for our Biological Sciences students but not for our Medical Sciences Emphasis students.
- (7) CBNS 165 is a relatively new course and would be an appropriate elective for all three emphases in Biochemistry.
- (8) CBNS 169 is already listed as an approved elective for our Biological Sciences students but not for our Medical Sciences Emphasis students.

Approvals:

Approved by the faculty of the Department of Biochemistry:

December 1, 2017,
March 21, 2019,
December 16, 2019

Approved by the Executive Committee College of Natural and Agricultural Sciences:

January 14, 2020

Reviewed by the Committee on Undergraduate Admissions:

March 13, 2020

Approved by the Committee on Educational Policy:

April 22, 2020