Biochemistry and Molecular Biology (BMB) Major Requirements

General Information

The BMB curriculum is an exciting, rigorous, and extremely rewarding course of study that prepares undergraduates for employment in a wide range of scientific, technical, and educational fields. These include positions with university, government, and medical laboratories; positions related to science policy, patent law, biotechnology companies, food industries, clinical laboratories, and scientific equipment suppliers, to name a few. BMB graduates are well positioned to undertake Masters and PhD graduate work in areas such as agricultural biotechnology, genomics, molecular genetics, immunology, pharmacology, virology, physiology, and nutrition. Many BMB graduates go on to medical school, dental school, pharmacy school, physician's assistant programs, and advanced training in many other healthcare professions.

Predictor Courses

Foundational Predictor Courses

BMB majors must achieve a GPA of 2.5 or better across the following four courses in their first three semesters in order to continue in the BMB major:

- General Chemistry I
- General Chemistry II
- Calculus I
- Calculus II

These courses are strong predictors of success in BMB and in science, as they are essential for developing the quantitative/organizational skills necessary for success.

BMB majors should aim to earn B- or better in each of these four courses.

Gateway Predictor Course

BMB majors must achieve a B- or better in Biochem 285 – Cellular & Molecular Biology as a prerequisite for other Biochem courses.

Statistics show that earning below a B- in Biochem 285 frequently leads to earning below a C in upper-level Biochemistry courses.

Commit yourself to doing well in predictor courses!

Many courses have prerequisites; it is up to the student to determine these and satisfy them. In addition to a minimum grade of B- in Biochem 285, BMB majors should achieve a C- or above in all Biochem courses required for the major. BMB does not accept any courses taken pass/fail toward our major requirements.

Major Requirements

Foundational Courses

Introductory Biology

- Bio 151 – Introductory Biology I
    - BIOTAP members take Bio 161H instead of Bio 151.
- Bio 152 – Introductory Biology II
- Bio 153 – Introductory Biology Lab
    - Bio 153 can be taken concurrent with or after Bio 152.

Bio 151, 152, and 153 cannot be replaced by Advanced Placement (AP) Biology credits and are not waived by the BMB department. BMB majors should earn a grade of C or better as a prerequisite for future courses.

General Chemistry

- Chem 111 – General Chemistry for Science Majors I
    - Requires a Math Placement Test score of 20 or above on Part A.
    - Chem AP score of 4 or 5 is accepted as Chem 111 only.
    - Commonwealth Honors College (CHC) students take Chem 121H.
- Chem 112 – General Chemistry for Science Majors II
    - Commonwealth Honors College (CHC) students take Chem 122H.

Calculus

- Calc I: Math 127 or Math 131
    - Math 127 requires Math Placement Test score of 20 or above on Part A.
    - Math 131 requires Math Placement Test score of 23 or above on Part A.
- Calc II: Math 128 or Math 132

College Writing

- EnglWrit 112 – College Writing
    - College Writing is required for all first year students.
    - Commonwealth Honors College (CHC) students take EnglWrit 112H.
    - English Language and Composition AP Score of 4 or 5 is accepted as EnglWrit 112.

General Education (GenEd) Course Requirements

- BMB major requirements will fulfill 4 GenEd math and science requirements.
- BMB majors must take at least 5 additional GenEd courses (19 cr).
- BMB students should periodically check their Academic Requirements Report (ARR) in SPIRE for their progress on GenEd course requirements (please note that these requirements are determined by the University, not the BMB program). Students should direct all GenEd questions to the Records Office, 213 Whitmore; or see www.umass.edu/gened.

Core Courses

Biochem 285 – Cellular & Molecular Biology

- Prerequisites: Bio 151 and Bio 152 with a grade of C or better, and Chem 111 (or 121H) and Chem 112 (or 122H) with a grade of C- or better.
- This is the first Biochem course that BMB majors take.
- Bio 285 and Ansci 285 are equivalent courses, meaning they will also count toward the Biochem 285 requirement.
- A grade of B- or better is required to continue in the BMB major.

Biochem 291H – Honors Colloquium

- 1-credit seminar required for BMB majors who are in the Commonwealth Honors College (CHC).
- Non-CHC BMB majors are encouraged to take the course and are accommodated as space permits.
- This course is not offered every year.

Organic Chemistry

- Chem 261 – Organic Chemistry I
    - Prerequisite: Chem 112 or Chem 122H with a grade of C- or better.
- Chem 262 – Organic Chemistry II
    - Prerequisite: Chem 261 or Chem 265 with a grade of C- or better.
- Chem 269 – Organic Chemistry Lab
    - Prerequisite: Chem 261 or Chem 265 with a grade of C- or better.
    - Can be taken concurrent with or after Chem 262.

Students can take Chem 265, Chem 266, Chem 267, and Chem 268 with permission from the Chemistry Department.

Physics

- Physics I: Physics 131 or Physics 151 or Physics 181
    - Physics 1 AP Score of 3, 4, or 5 is accepted as Physics 131.
    - Physics C – Mechanics AP Score of 4 or 5 is accepted as Physics 151.
    - Physics 181 can only be taken by non-Physics majors with consent from the instructor.
- Physics II: Physics 132 or Physics 152 or Physics 182
    - Physics 2 AP Score of 3, 4, or 5 is accepted as Physics 132.
    - Physics C – Elec & Mag AP Score of 4 or 5 is accepted as Physics 152.
    - Physics 182 can only be taken by non-Physics majors with consent from the instructor.

Math/Statistics

Students are required to take one math or statistics course in addition to Calc I and Calc II. Options include:

- Math 233 – Multivariate Calculus
- An approved statistics course
    - Stats 240
    - Stats 501 (open to juniors and seniors only)

    - Psych 240 (open to Psych majors only)
    - ResEcon 212
- Statistics AP Score of 4 or 5

Upper-Level Courses

All course prerequisites require a C- or better unless otherwise noted.

Biochem 311 – Genetics

- Prerequisites: Bio 151 and Bio 152, both with a grade of C or better.
- Bio 311 and Ansci 311 are equivalent courses, meaning they will also count toward the genetics requirement.

Biochem 376 – Introductory Biochemistry Lab

- Prerequisites: Biochem 285 with a grade of B- or better.

Biochem 394RI – Real World Biochemistry

- Prerequisites: Biochem 285.
- Fulfills the Integrative Experience (IE) requirement.
- Students in the iCons program satisfy the IE requirement with different courses and should not take Biochem 394RI.

Biochem 423 – General Biochemistry I

- Prerequisites: Chem 261 and Chem 262.

Biochem 424 – General Biochemistry II

- Prerequisites: Biochem 423, Chem 261, and Chem 262.

Biochem 426 – Advanced Biochemistry Lab

- Prerequisites: Biochem 376 and Biochem 423.

Biochem 430H – Biochemistry Writing Seminar

- Prerequisites: Biochem 423.
- Fulfills the Junior Year Writing (JYW) requirement.
- Students in the iCons program satisfy the JYW requirement with different courses and should not take Biochem 430H.

Biochem 471 – Elementary Physical Chemistry

- Prerequisites: Chem 112 or 122H and Physics 132, 152 or 182 and Math 128 or 132.

Advanced Elective Courses

Students are required to earn a minimum of 8 credits of Advanced Electives.

Advanced elective options include many (but not all) science and math courses numbered 300 and above, including Independent Study/Research credits earned conducting research in a lab. A list of suggested Advanced Elective course options can be found on the BMB website, and questions about additional courses can be directed to the BMB Chief Undergraduate Advisor.

Courses required for the BMB major, including Biochem 430H and Biochem 471, and courses intended for non-BMB majors, such as Biochem 320 and 321, do not count toward advanced elective requirement. Practicum courses, such as Biology 398A or Biochem 498A, also do not count toward advanced elective credits.

Total credits

UMass Amherst requires a minimum total of 120 credits for graduation.

Completion Time

BMB keeps close track of graduation dates and prioritizes primary majors getting out in 4 years. If students choose to add majors and minors, it may take them longer because our focus is on a single major in BMB in 4 years. To ensure that BMB majors graduate in a timely manner, enrollment in upper-level courses is monitored and students are prioritized based on how long they've been in the major.

BMB Worksheet for Majors Name: _____

Overall credits left: _____ / _____ semesters = _____ average credits per semester

Foundational Courses

Must earn a **grade of C or better:**

Intro Bio (Cellular Bio and Genetics) Bio 151 (4CR) _____

Intro Bio (Diversity, Physiology, Evolution) Bio 152 (3CR) _____

Intro Bio Laboratory Bio 153 (2CR) _____

Note: a 4-CR course equivalent to Bio 151+lab or Bio 152+lab completes this requirement

Must earn a **grade of C- or better:**

General Chemistry I Chem111/121H (4CR) _____

General Chemistry II Chem 112/122H (4CR) _____

Calculus I Math 127 (3CR) or Math 131 (4CR) _____

Calculus II Math 128 (3CR) or Math 132 (4CR) _____

Note: must have a **GPA of 2.5 or above among these four courses** in addition to C- or better

GenEds not satisfied through major:

College Writing (EngWrit112)

AT (arts)/AL (literature)

HS (historical studies)

SB (social and behavioral studies)

Social World (AT, AL, SB, I, or SI)

DG (global diversity)

DU (United States diversity)

Second Year Core Courses

Must earn a **grade of C- or better:**

Organic Chemistry I Chem 261 (3CR) _____

Organic Chemistry II Chem 262 (3CR) _____

Organic Chemistry Laboratory Chem 269 (2CR) _____

Note: a 1-CR Organic Chemistry lab may be accepted toward the major, but is usually not sufficient for med/health/grad school programs

Math: Intermed. Stats or Math 233 (Calc III) or ResEcon212 Stats 240 (4CR) _____

Physics I: Mechanics Physics 131 or 151 (4CR) _____

Physics II: Electricity and Magnetism Physics 132 or 152 (4CR) _____

Molecular and Cellular Biology Biochem 285 (3CR) _____

Prerequisites: Bio 151, 152 and Chem 111, 112

Note: Must earn a **grade of B- or better** in Biochem 285. AnSci 285 and Bio 285 are equivalents.

Biochemistry Major Courses

Biochemistry Laboratory, writing intensive Biochem 376 (3CR) _____

Integrative Experience Biochem 394RI (3CR) _____

Genetics AnSci/Bio/Biochem 311 _____ *(Biochem version is spring only)*

General Biochemistry Biochem 423 (3CR) _____

Prerequisites: Biochem 285 with B- or better, Chem 261 and 262 or equivalents with C- or better

Thermo and Quantum Mechanics (Pchem) Biochem 471 (3CR) _____

Prerequisites: Chem 112 and Physics 132 and Math 128, all with C- or better

Courses that require Biochem 423 (C- or better):

General Biochemistry II Biochem 424 (3CR) _____

Biochemistry Writing Seminar (Jr. Year Writing) Biochem 430H (3 CR) _____

Advanced Biochemistry Lab Biochem 426 (4CR) _____

Prerequisites: Biochem 376 lab and Biochem 423

Advanced Electives in Biochemistry: 3 approved classes in fields related to Biochemistry at the 300 level or higher:

_____ _____ _____