

Biochemistry and Molecular Biology

BIOLOGICAL SCIENCES

Charles J. Bieberich
Molecular biology of development

Rachel Brewster
Developmental biology, neuroscience, genetics, molecular and cell biology

Mauricio M. Bustos
Molecular biology

Nessly C. Craig
Molecular biology of mammalian cells

David M. Eisenmann
Developmental biology, genetics, molecular biology

Philip J. Farabaugh
Molecular genetics of translational accuracy, ribosome structure-function analysis

Stephen Freeland
Computational biochemistry, relationship of properties of amino acids to protein function and evolution

Lasse Lindahl
Molecular biology, gene expression

Patricia McGraw
Molecular biology, membrane transport

Tamra Mendelson
Speciation, molecular systematics, behavioral ecology

Stephen M. Miller
Developmental biology, molecular biology, evolution

Kevin Omland
Evolution, molecular systematics, avian behavior/ecology

Michael C. O'Neill
Genetic regulation

Phyllis R. Robinson
Neurobiology

Suzanne O. Rosenberg
Immunology, cancer biology

Harold Schreier
Molecular biology, prokaryotic gene regulation

Richard E. Wolf, Jr.
Molecular biology, gene regulation

Janice Zengel
Molecular biology/genetics, structure/function of RNA, ribosome synthesis

CHEMISTRY AND BIOCHEMISTRY

Bradley R. Arnold
Time-resolved polarized spectroscopy

C. Allen Bush
Biophysical chemistry of complex carbohydrates

Daniele Fabris
Bioanalytical chemistry, mass spectrometry of nucleic acid adducts, protein-nucleic acid interactions

James C. Fishbein
Organic chemistry, reaction mechanism and reactive intermediates, chemical toxicology, chemical carcinogenesis, cancer chemoprevention

Ramachandra S. Hosmane
Organic synthesis, antiviral and antineoplastic compounds, artificial blood and hemoglobin research

Richard L. Karpel
Protein-nucleic acid interactions, single-stranded DNA binding proteins

Lisa A. Kelly
Photoredox-initiated bond cleavages

William R. LaCourse
Pulsed electrochemical detection techniques, advanced analytical methodology

Mark Perks
Organic and environmental chemistry

Katherine L. Seley-Radtke
Medicinal chemistry, organic synthesis, nucleic acids, nucleoside drug design

Paul J. Smith
Protein and DNA binding by small molecules

Michael F. Summers
Nuclear magnetic resonance, studies of proteins and macromolecular interactions

Veronika A. Szalai
Bioinorganic chemistry of amyloid proteins, nucleic acid-based magnetic materials

robiology, laser spectroscopy and plant molecular biology, give students the opportunity to work in actual research programs while being mentored by experienced, enthusiastic and dedicated faculty.

Career and Academic Paths

A significant proportion of UMBC biochemistry graduates continue their education in graduate and other professional programs, including at such highly competitive schools as Harvard; University of Virginia; Duke; Washington University; Stanford; University of California, San Francisco; MIT; The Johns Hopkins University; Princeton; Cal Tech and Carnegie Mellon.

Program graduates also compete well in the workforce, finding employment with such organizations as the National Cancer Institute, Hoffmann LaRoche, Proctor & Gamble, GlaxoSmithKline and the FDA.

Academic Advising

First-year students (both freshman and transfer students) who express an interest in biochemistry and molecular biology initially will be advised by the program's first-year advisor. After one year, they will be assigned to one of the participating faculty for advising. Students are required to see their advisors at least once each semester. Academic progress is monitored through graduation.

Major Program

Bachelor of Science (B.S.)

The B.S. program consists of 75-78 credits distributed as in the following list. Note that CHEM 437, 438, 437L and the two electives must be completed at UMBC. Taking any other courses required for the major while enrolled at UMBC must be approved by the program.

A. Chemistry (26-27 credits)

CHEM 101
Principles of Chemistry I

Courses in this program are listed under BIOL and CHEM.

The Biochemistry and Molecular Biology Program (under the auspices of the Departments of Biological Sciences and Chemistry and Biochemistry) offers students an interdisciplinary curriculum that exposes students to a diverse range of faculty members. With a

curriculum drawing from both disciplines, as well as specific biochemistry courses, the program provides a broad background in the physical and life sciences. It is suitable for students planning careers in laboratory research or further training in graduate, medical or other biomedical

professional programs, such as medicine, dentistry and medical technology. Research centers for electron and light microscopy, mass spectrometry, X-ray crystallography, nuclear magnetic resonance spectroscopy and labs specializing in varied topics, including gene regulation, neu-

CHEM 102
Principles of Chemistry II

CHEM 102L
Introductory Chemistry Lab

CHEM 300
Analytical Chemistry

CHEM 301
Physical Chemistry I

OR

CHEM 303
Physical Chemistry for the
Biochemical Sciences

CHEM 351
Organic Chemistry I

CHEM 352
Organic Chemistry II

CHEM 351L
Organic Chemistry
Laboratory I

CHEM 352L
Organic Chemistry
Laboratory II

**B. Biology
(15 credits)**

BIOL 100
Concepts of Biology

BIOL 100L
Concepts of Biology
Laboratory

BIOL 302
Molecular and General
Genetics

BIOL 303
Cell Biology

BIOL 302L
Molecular and General
Genetics Laboratory

OR

BIOL 303L
Cell Biology Laboratory

**C. Biochemistry
(12 credits)**

CHEM 437
Comprehensive
Biochemistry I

CHEM 437L
Biochemistry Laboratory

CHEM 438
Comprehensive
Biochemistry II

**D. Any two of the following
electives (6-8 credits):**

BIOL 411
Bacterial Physiology

BIOL 414
Eukaryotic Genetics and
Molecular Biology

BIOL 420
Advanced Topics in Cell
Biology

BIOL 425
Immunology

BIOL 426
Approaches to Molecular
Biology

BIOL 428
Computer Applications in
Molecular Biology

BIOL 434
Microbial Molecular
Genetics

BIOL 443
Advanced Topics in
Developmental Biology

BIOL 445
Signal Transduction

BIOL 451
Neurobiology

BIOL 454
Vision Science

BIOL 456
Plant Molecular Biology

BIOL 475
Biology of Bacteria

BIOL 476
Antibiotics: Origin,
Mechanism, Resistance

BIOL 483
Evolution: From Genes to
Genomes

CHEM 406
Bioinorganic Chemistry

CHEM 431
Chemistry of Proteins

CHEM 432
Advanced Biochemistry

CHEM 433
Biochemistry of Nucleic
Acids

CHEM 435
Biochemistry of Complex
Carbohydrates

CHEM 441
Physical Chemistry of
Macromolecules

CHEM 442
Physical Biochemistry

CHEM 443
Molecular Spectroscopy of
Biomacromolecules

CHEM 444
Molecular Modeling in
Biochemistry

CHEM 450
Chemistry of Heterocyclic
Compounds

CHEM 451
Mechanisms of Organic
Reactions

CHEM 453
Organic Chemistry of
Nucleic Acids

CHEM 455
Biomedical Chemistry

CHEM 457
Total Synthesis of Natural
Products

CHEM 461
Advanced Instrumental
Methods of Analysis

CHEM 470
Toxicological Chemistry

CHEM 472
Enzyme Reaction
Mechanisms

CHEM 601
Special Topics in
Chemistry: Advance NMR
Spectroscopy

CHEM 635
Biochemistry of Complex
Carbohydrates

CHEM 640
Special Topics in Molecular
Structure

CHEM 680
Seminar in Biophysical
Chemistry

CHEM 682
Current Topics in
Biochemistry

CHEM 684A
Special Topic: Organic
Spectroscopy

**E. Mathematics and
Physics (16 credits)**

PHYS 121
Introductory Physics I

PHYS 122
Introductory Physics II

MATH 151
Calculus and Analytic
Geometry I

MATH 152*
Calculus and Analytic
Geometry II

**F. Individual Lab Research
1-4 credits (recommended)**

Students have the opportunity to integrate what they have learned by doing independent research with participating faculty. Those working with a biological sciences faculty member may register for BIOL 399 or 499. Those working in a chemistry and biochemistry faculty laboratory may register for CHEM 399 or 499.

* MATH 251 and CHEM 302 are recommended for those anticipating graduate study in chemistry, biophysical chemistry or biophysics.

G. Electives

The following courses, which have variable topics, may be approved as biochemistry electives in those years when their topic is appropriate (subject to confirmation in each case by the Biochemistry Undergraduate Committee):

54 BIOCHEMISTRY AND MOLECULAR BIOLOGY

CHEM 490A
Special Topics in
Chemistry

CHEM 601
Current Topics in
Chemistry

CHEM 670
Special Topics in Dynamics
and Mechanisms

CHEM 684
Special Topics in
Chemistry

save money and reduce their
graduate course work.

Students should consult with
the director of the Applied
Molecular Biology Program
for advisement as to which
courses will be appropriate
for both degrees. Application
for admission should be
submitted prior to the final
semester of the senior year.
For more information, see the
APMB Web site at www.umbc.edu/biosci/grad/amb.php.

In fulfilling major requirements, CHEM 437, 438 and 437L must be completed at UMBC, with a grade of "C" or better. An overall "C" average must be maintained in required courses. Prerequisites for all courses in the major must be satisfied with a grade of "C" or better.

Honors Program

While the Biochemistry and Molecular Biology Program does not have an honors program, specific honors sections of BIOL 100H: Concepts of Biology and CHEM 101H and CHEM 102H: Introductory Chemistry courses are offered. In addition, selected upper-level courses are offered as honors program courses.

Biochemistry and molecular biology majors are eligible for departmental honors in the Department of Biological Sciences and in the Department of Chemistry and Biochemistry. Information on the requirements for departmental honors are available in the sections of this catalog devoted to each department.

Combined B.S./M.S.

Students interested in the Applied Molecular Biology (APMB) Program will be considered for admission to the program on a competitive basis. Students can use up to two courses from their undergraduate degree in biochemistry and molecular biology and, in so doing,

Special Opportunities

Biochemistry majors have the opportunity to participate in research in both participating departments at UMBC, as well as at nearby institutions such as the National Institutes of Health. Special programs and fellowships have placed biochemistry students in labs of eminent scientists nationally and internationally.

Many advanced biochemistry and molecular biology majors are tutors in the Chemistry Tutorial Center, helping to provide free tutoring for fellow students enrolled in freshman and sophomore chemistry courses.

Student Organizations

Biology and Chemistry/ Biochemistry Council of Majors

Biochemistry majors play an active role in the Biology Council of Majors (BCOM) and in the Chemistry/Biochemistry Council of Majors (CHEM/COM), an American Chemical Society student affiliate chapter. Each group supports active professional and social programs. More information on the activities of these organizations section is available in the biological sciences and chemistry and biochemistry sections of this catalog. In addition, majors are often active in various pre-professional societies (pre-medical, pre-dental, etc.) on campus.