



# Biochemistry Education

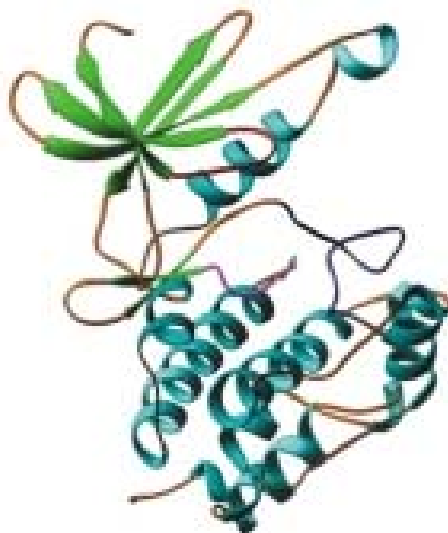
Department of Biochemistry & Molecular Biology

## Undergraduate Major

Department of Biochemistry & Molecular Biology  
247 Basic Medical Sciences Building  
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## *Bachelor of Science Degree*

Alexander Pope advised "The proper study of mankind is man." Put into other words, the essence of a liberal education is that we attempt to understand ourselves and our interactions with nature. Biochemistry is the discipline that approaches this understanding from the direction of the physical sciences. It is the study of the chemistry of life. Biochemistry addresses fundamental questions: How is food converted into energy or body substance? How is genetic inheritance translated into phenotypically expressed properties? How do enzymes, the biological catalysts, differ in power and specificity and controllability from other catalysts? How are nerve pulses transmitted, and how do we think? What is the chemical basis for health and disease? How are all living creatures alike, and how do we differ? How do pollutants and pesticides affect life? Can we meet human needs by manipulating the DNA of bacteria, plants, and animals? The best reason for studying Biochemistry is that it is the study of ourselves and our chemical relationship with the environment.



### Program Description

**Biochemistry is an undergraduate major in the College of Arts & Sciences.** The Bachelors degree in Biochemistry meets or exceeds all of the curricular recommendations suggested by both the American Chemical Society and the American Society of Biochemistry and Molecular Biology. In addition, the program is consistent with current national recommendations for education practices in the 21st century.

Although the major in Biochemistry is offered by the College of Arts and Sciences, the Department of Biochemistry and Molecular Biology is organizationally and physically part of the School of Medicine just north of the main campus. Some courses are given on the main campus, while more advanced courses and senior research are conducted in two modern, excellently equipped building in the Medical School complex.

### Curricular Overview

Biochemistry and Molecular Biology education at the University of New Mexico is a small but comprehensive program in which instruction takes place in classes with relative few students in small learning communities. Where possible, instruction is individualized and there is significant interaction between student and faculty. The program strives to make research-based and inquiry-based learning the normal learning mode and encourages all students to become involved in the research and teaching opportunities available within the department. Each spring there is a capstone experience for students at the annual departmental retreat in which students present the results of their individual research projects.

Students majoring in Biochemistry are encouraged to seek academic advisement from the Department early in their college experience. In addition, to complete degree requirements within 4 years, Biochemistry majors should plan on taking two science or math courses each semester. The Department encourages all students to become involved in both the research and teaching opportunities available within the department. For more information about these opportunities or about the major in Biochemistry, consult the Departmental WEB site: <http://hsc.unm.edu/bmb>

A total of 65 credit hours are required for the BS degree. No minor course of study is required for the Biochemistry major. The core courses are required of both BA and BS students and students must complete the one year sequence of organic chemistry courses before they can register for their first Biochemistry course. Students should plan on beginning the Biochemistry courses during their Junior year. To individualize the student's course of study as much as possible there are several options for completing the Math, Physics, General Chemistry and Physical Chemistry portions of the curriculum. In addition, students should consult with a departmental advisor when selecting their advanced Biochemistry courses.

### **Core Courses**

<b>Calculus:</b>	<b>MATH 162-163</b>	(or 180-181)
<b>Physics:</b>	<b>PHYS 151–151L, 152–152L</b>	(or 160-160L, 161-161L, 262)
<b>Biology:</b>	<b>BIOL 201-202</b>	
<b>Gen &amp; Quant Chem:</b>	<b>CHEM 121L-122L, 253L</b>	(or 131L-132L)
<b>Organic Chem:</b>	<b>CHEM 301–302and 303L–304L</b>	(or 307-303L and 308-304L)
<b>Biochemistry:</b>	<b>BIOC 445–446</b>	

### **Advanced Course Requirements**

<b>Biochemistry Lab:</b>	<b>BIOC 448L</b>	
<b>Physical Chem:</b>	<b>CHEM 315 and BIOC 451</b>	(or CHEM* 311-312 ) *Math 264 is required
<b>Advanced Biochemistry:</b>	<b>Six (6) credit hours from Biochemistry courses above BIOC 450) or approved courses in related disciplines to a minimum of 65 credit hours.</b>	

Note that research courses (BIOC 497,498,499) cannot be used to satisfy this requirement.

**No minor study is required**

To complete the Biochemistry degree in 4 years requires both a strong high school science and math background as well as taking 5 courses each semester during college. The prospective student should understand that there is no typical 4-year program. Students come into this program with unique backgrounds and career goals, allow which are reflected in their course schedule. The example schedule outlined below allows the student to complete all Arts & Sciences and Biochemistry graduation requirements within 4 years. This schedule is presented to assist in planning your courses.

## Example 4-year schedule

Fall Semester	Spring Semester
<b>Freshman Year</b>	
<b>CHEM 121L</b> (4 credits) <b>MATH 162</b> (4 credits) <b>BIOL 201</b> (4 credits) Group Requirement (3 credits)	<b>CHEM 122L</b> (4 credits) <b>MATH 163</b> (4 Credits) <b>BIOL 202</b> (4 credits) Group Requirement (3 credits) Group Requirement (3 credits)
<b>Sophomore Year</b>	
<b>CHEM 301</b> (3 credits) <b>CHEM 303L</b> (1 credit) <b>PHYS 151</b> (3 credits) <b>PHYS 151L</b> (1 credit) Group Requirements (3 credits) Group Requirements (3 credits) Group Requirements (3 credits)	<b>CHEM 302</b> (3 credits) <b>CHEM 304L</b> (1 credit) <b>PHYS 152</b> (3 credits) <b>PHYS 152L</b> (1 credits) <b>CHEM 253</b> (3 credits) Group Requirement (3 credits)
<b>Junior Year</b>	
<b>BIOC 445L</b> Intensive Biochemistry I (4 credits) <b>CHEM 315</b> (4 credits) Elective (3 credits) Group Requirement (3 credits) Group Requirement (3 credits)	<b>BIOC 446L</b> Intensive Biochemistry II (4 credits) <b>BIOC 448L</b> Biochemistry Lab (3 credits) <b>BIOC 451</b> (4 credits) Elective (3 credits) Group Requirement (3 credits)
<b>Senior Year</b>	
<b>BIOC Elective</b> (3 credits) <b>BIOC 499 or 497</b> Research (3 credits) Group Requirement (3 credits) Elective (3 credits) Elective (3 credits)	<b>BIOC Elective</b> (3 credits) <b>BIOC 499 or 498</b> Research (3 credits) Group Requirement (3 credits) Elective (3 credits) Elective (3 credits)

## How to Succeed as a Biochemistry Major

Because the Biochemistry major requires a number of prerequisite courses, you probably won't take any of the courses taught by Biochemistry faculty until at least your junior year, but you should **declare your major as soon as possible** and develop a plan for taking all your courses. You need to plan carefully for the courses that are only offered once per year. Remember you need to complete both the requirements for the Biochemistry major and the Arts & Sciences Group requirements. You should plan on completing these tasks simultaneously. If you delay beginning your science courses until you have completed the Arts & Sciences Group Requirements, you will be extending the time required to finish your Bachelors degree. If you intend to major in Biochemistry, you are encouraged to speak with a Biochemistry academic advisor early in you college training.

**Get the best grades you can in all of your courses.** This will help you no matter what your ultimate goal. **Allow two full academic years to complete the Biochemistry courses;** this will enable you to get the most out of your courses, and give you the opportunity to accomplish a significant research project. All students should routinely check the announcements for summer research and education programs which are posted on bulletin boards in the Biology, Chemistry and Biochemistry departments, as well as posted on the Biochemistry Web site. The application deadlines for summer programs are usually early in the year.

**Honors and Research** - The Biochemistry Department offers summer stipends each year to encourage full-time research during the summer between the junior and senior years. Students who wish to earn the bachelor's degree with honors need to allow at least two semesters for a significant project. Most of those who have elected to do research have been co-authors on research publications. Some Biochemistry majors have done honors research in the laboratories of other School of Medicine faculty members. If you identify

such an opportunity, be sure to get the project approved by the Departmental Honors Advisor (Dr. Dorothy VanderJagt).

Make an attempt to meet **Biochemistry faculty members** to find out what research projects are being carried out, and what opportunities are available for majors. A list of the Biochemistry faculty and their research interests can be found on the Biochemistry Web site (<http://hsc.unm.edu/som/bmb>). Some laboratories have work - study positions available, and most laboratories are happy to accept volunteers, especially after some laboratory experience has been attained. Minority students should look for support through the **Minority Biomedical Research Support (MBRS)** program or the **Minority Access to Research Careers (MARC)** program.

## **Career Planning**

As stated earlier in this document, the best reason for studying Biochemistry is that it is the study of ourselves and our chemical relationship with the environment. Beyond this intrinsic interest, Biochemistry is a foundation for many careers. It provides an excellent preparation for graduate work in Biochemistry, microbiology, immunology, and other biomedical sciences. Biomedical engineering, the designing of materials and instruments for therapy and diagnosis, has roots in Biochemistry. Much of the work of the director of a clinical laboratory is biochemical. Recombinant DNA research and monoclonal antibody production provide new diagnostic tools, new therapies, new ways to fight pests, improve agriculture, and clean the environment. Pharmaceutical companies need biochemists to design and evaluate new drugs. The Biochemistry major is an excellent preparation for professional training in medicine, dentistry, clinical nutrition, public health, and veterinary medicine. Finally the Biochemistry major, with its broad foundation in biology, chemistry, physics, and math, is an ideal program for future science teachers. More information on Biochemistry careers is available at both the American Chemical Society ([chemistry.org](http://chemistry.org)) and American Society of Biological Chemists and Molecular Biologists ([ASBMB.org](http://ASBMB.org)) Web sites.

For more specific information about majoring in Biochemistry, contact the program director.

### **Program Director**

**William L. Anderson, Ph.D.**

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