Studies leading to the Ph.D. degree in biochemistry are offered by The Graduate Center of The City University of New York (CUNY) with research performed at several participating CUNY colleges. While separate facilities are maintained at each campus, all students meet with the collective faculty at The Graduate Center (located in midtown Manhattan) for nonlaboratory courses and seminars.

Because biochemistry is an interdisciplinary science that draws upon fundamental chemical theory and research techniques as the basis for exploration into the problems of biology, a firm grounding in chemistry is required as well as a sophisticated knowledge of biology. Students are required to complete courses in general biochemistry, bioorganic chemistry, physical biochemistry, biology, and advanced biochemistry topics. In addition, they must actively participate in biochemistry seminars for five semesters by making at least one oral presentation during each semester. Further course work outside of the Ph.D. Program in Biochemistry is undertaken with the advice of the student’s mentor and doctoral dissertation committee.

In addition to the course requirements noted above, the student is required to complete two examinations dealing with course and literature material and to present a dissertation defense. The First Examination is taken in two parts: Part I after the student’s first semester in the program and Part II at the end of the first year. This examination tests the student’s competence in the material covered in the core biochemistry courses. The Second Examination, which the student is expected to complete within two years after passing the First Examination, tests the student’s ability to define a significant research problem and to devise approaches toward its solution. This involves both written and oral presentations by the student to the doctoral dissertation committee.

At the heart of the program leading to the Ph.D. is the dissertation requirement. The degree is viewed fundamentally as a research degree, and the student is expected to begin laboratory work toward the dissertation by the end of the first year in residence. To assist the student in the choice of a project and mentor, a laboratory rotation during the first year of residence is scheduled in which the student participates in the research efforts of several laboratories. This serves both to expose the student to a wide variety of biochemistry laboratory techniques and to give a detailed view of various research efforts in progress at CUNY.
Seminars and Colloquia

Participation in university, departmental, and research seminars is an integral part of doctoral training at the City University. The university-wide biochemistry colloquia and the departmental seminars at each campus offer students in biochemistry the opportunity to attend lectures by leading biochemists on a wide range of topics. In addition, students may attend special lectures at other major universities in the New York City area, as well as at other institutions such as, for example, the New York Academy of Sciences.

Facilities

Standard equipment for research in biochemistry and molecular biology is maintained at each participating campus. In addition, central facilities exist at several campuses for molecular biology and physical biochemistry. These facilities include instrumentation and support services for DNA synthesis, peptide synthesis, peptide sequencing, electron microscopy, and high-field NMR measurements including 500 MHz and 600 MHz instruments. The computational facilities of CUNY are excellent. A central computer facility at The Graduate Center and a number of medium-sized computers located at the individual campuses permit extensive data accumulation and handling needed, for example, for operating molecular modeling systems.

Each of the campuses maintains a library with up-to-date collections of leading journals. The Humanities and Social Sciences Library of the New York Public Library on 42nd Street, located only minutes from The Graduate Center, has one of the most comprehensive collections of biochemical literature available to faculty and students of the Ph.D. Program in Biochemistry.

Financial Assistance

Virtually all students of the Ph.D. Program in Biochemistry receive full-time financial support. First-year students are supported by teaching assistantships provided by the participating colleges, fellowships, and combinations thereof. Although advanced students may be supported in a similar manner, they often receive assistantships paid by research grants awarded to individual faculty members. The average financial support per student is currently close to $24,000.

Tuition

The tuition for full-time (7 or more credits), first-level students who are New York State residents is $2,860 per semester ($560 per credit for out-of-state students); second-level full-time students pay $1,793 per semester ($3,983 for out-of-state students); third-level students maintain matriculation by paying $710 per semester ($1,423 for out-of-state students). A few tuition waivers are awarded to biochemistry Ph.D. students.

Admissions

Entering students should have a strong background in physical and biological sciences, including organic chemistry, physical chemistry, physics, and mathematics through calculus. They should also have taken courses in biochemistry and biology, as for example, cell biology and genetics. Students may be admitted with deficiencies, but they will be required to correct them during the first three semesters. The Graduate Record Examination is required.

Students may apply for admission to the Ph.D. Program in Biochemistry in 3 ways:
1. complete the application online through the Office of Admissions’ webpage at www.gc.cuny.edu/
2. download the application form from the same webpage
3. request an application by emailing (biochemistry@gc.cuny.edu) or writing to the Biochemistry program office.

The application includes a financial aid form. Please note that students should indicate on the
application their preference for a “home” campus site. Refer to the listing of faculty and their home campuses on the program’s website (http://web.gc.cuny.edu/biochemistry) before making a selection. Admission decisions are made soon after receipt of all required background information, including academic transcripts, Graduate Record Examination results, and letters of recommendation. Foreign students are strongly encouraged to submit results of their TOEFL language examination. It is advisable to apply early in the senior year to improve chances of receiving financial aid. Admission is possible to both the fall and spring semesters.

THE CITY UNIVERSITY OF NEW YORK

The City University of New York (CUNY), the nation’s largest urban university, consists of ten senior colleges, six community colleges, a college of technology, The Graduate Center, a law school, a medical school, and a graduate school of journalism. More than 200,000 students are enrolled in academic programs offered at campuses located throughout the five boroughs of New York City. The New York State Legislature established CUNY in 1961 to join together the existing independent municipal colleges, but its history dates back to 1847 when the precursor to City College was established. Its mission today is, as it was then, to “educate the whole people,” to uphold a commitment to academic excellence while providing equal access to opportunity for education.

Doctoral programs, established in 1961 at The Graduate Center, build on more than a century of excellence in education and are now offered in most areas of the liberal arts and sciences, and in audiology, business, criminal justice, engineering, physical therapy, and social welfare. Graduate work leading to the master’s degree was established in 1856 at City College and is now offered at all CUNY senior colleges.

ABOUT THE GRADUATE CENTER

Founded in 1961, The Graduate Center is the doctorate-granting institution of The City University of New York (CUNY). In this nationally unique consortium of 1700 faculty members, a core faculty of 125 Graduate Center appointments is supplemented by over 1500 additional faculty members drawn from throughout CUNY’s colleges and New York City’s leading cultural and scientific institutions. With 4000 doctoral students, they pursue a shared enterprise of expanding the boundaries of knowledge in over 30 doctoral programs and 6 master’s programs in the humanities, social sciences, and sciences. Augmenting this enterprise are 28 research centers and institutes focused on areas of compelling social, civic, cultural, and scientific concerns.

Also affiliated with the institution are three University Center programs: the CUNY Baccalaureate Program through which undergraduates can earn bachelor’s degrees by taking courses at any of the CUNY colleges; the School of Professional Studies and the associated Joseph S. Murphy Institute for Worker Education and Labor Studies; and the recently established CUNY Graduate School of Journalism, which offers a master’s degree in journalism.

In addition, Continuing Education and Public Programs extends The Graduate Center’s intellectual and cultural resources to the general public, offering access to a wide range of events, including lectures, symposia, performances, and workshops.

Since 1999, The Graduate Center’s vibrant campus has been housed in a nine-story landmark building at 365 Fifth Avenue in midtown Manhattan. Formerly home to the B. Altman department store, the building has been redesigned as a new, state-of-the-art facility to meet the specific needs of a 21st-century institution of advanced learning.
Because of the consortial nature of doctoral study at The Graduate Center, courses take place at The Graduate Center and at CUNY colleges. For the most part, courses in the social sciences, humanities, and mathematics, and courses in the sciences requiring no laboratory work, convene at The Graduate Center. Science courses requiring laboratory work, courses for the clinical doctorates, and courses in business, criminal justice, engineering, and social welfare convene on CUNY college campuses. Courses for the Master of Arts in Journalism take place at 230 West 40th Street in Manhattan.

Since 1965, more than 8950 students have earned doctorates from The Graduate Center, and they are now among the leaders in our nation’s teaching and research efforts, whether at universities, in the nonprofit sector, in business, or in government. By preparing a group of highly qualified professionals from diverse backgrounds to assume leadership roles in a variety of fields, The Graduate Center, through its faculty members, programs, and research centers, is filling an urgent need in the city, the state, and the nation.

STUDY IN NEW YORK CITY

Studying and living in New York City can be one of the most rewarding experiences of a lifetime. Its diversity and opportunities in all areas of endeavor are well known. In addition to the advantage of being located in the center of one of the most important academic and research complexes in the country, the City University student will have available, a short distance from all the campuses, some of the world’s greatest cultural resources—the Broadway theater district and Off-Broadway, Lincoln Center for the Performing Arts, the Metropolitan Museum of Art, the Museum of Modern Art, the American Museum of Natural History, and the renowned Bronx Zoo and New York Botanical Garden complexes, to mention just a few major attractions. Recreational opportunities abound in all the boroughs of the city and in the surrounding suburbs.

Transportation and Housing

The City University Graduate Center in midtown Manhattan may be reached by public transportation from all campuses. An elaborate system of express buses and trains facilitates commuting to many areas of surrounding New Jersey, Westchester, Connecticut, and Long Island. The Assistant Director of Admissions coordinates matters pertaining to residence life, including helping students locate affordable housing within the New York City area. Entering students interested in obtaining housing information and assistance should contact the Assistant Director of Admissions at: reslife@gc.cuny.edu.

IMPORTANT NOTICE OF POSSIBLE CHANGES

The City University of New York reserves the right, because of changing conditions, to make modifications of any nature in the academic programs and requirements of the University and its constituent colleges without advance notice. Tuition and fees set forth in this publication are similarly subject to change by the Board of Trustees of The City University of New York. The University regrets any inconvenience this may cause.
BIOCHEMISTRY PROGRAM COURSES

All are 3-credit courses unless otherwise noted.

CORE COURSES

Required of all students, except for BICM 71130.

BICM 71010 - ADVANCED BIOCHEMISTRY I (Enzymology/Metabolism)
Protein structure, enzymology, and immunology; metabolism of carbohydrates, lipids, amino acids, and nucleotides; regulation of these processes.
Prerequisite: A one-semester course in biochemistry.

BICM 71020 - ADVANCED BIOCHEMISTRY II (Bioenergetics/Molecular Biology)
Membranes: structure, transport and other functions; muscle and cytoskeletal biochemistry; bioenergetics: respiration and photosynthesis; nucleic acids and protein synthesis.
Prerequisite: A one-semester course in biochemistry.

BICM 71110 - RESEARCH TECHNIQUES IN BIOCHEMISTRY I (4 credits)
During the course of one year each student will work in 3 or 4 research laboratories to solve clearly defined biochemical problems by use of modern research techniques.
Corequisite: BICM 71010.

BICM 71120 - RESEARCH TECHNIQUES IN BIOCHEMISTRY II (4 credits)
Continuation of Biochemistry 71110.
Prerequisite: BICM 71110.

BICM 71130 - RESEARCH IN BIOCHEMISTRY (4 credits)
One biochemistry problem will be solved by use of modern research techniques.
Prerequisites: BICM 71110 and BICM 71120.

BICM 72010 - BASIC SEMINAR IN BIOCHEMISTRY I (1 credit)
Each student will present at least one published paper related to the topics covered in BICM 71010.

BICM 72020 - BASIC SEMINAR IN BIOCHEMISTRY II (1 credit)
Each student will present at least one published paper related to the topics covered in BICM 71020.

BICM 75000 - BIOORGANIC CHEMISTRY
Chemistry of amino acids, sulfur, and phosphates; proton transfer; catalysis by fields, hydronium, and hydroxide ions; general acid-base catalysis; nucleophilic and electrophilic catalysis; metal ion catalysis; intramolecular catalysis; multiple catalysis; catalysis by complexation.

BICM 77000 - PHYSICAL BIOCHEMISTRY
Principles and applications of classical and statistical thermodynamics, spectroscopy, kinetics, and x-ray crystallography to the study of biomacromolecular and biochemical systems.
ADVANCED COURSES

All are 3-credit courses unless otherwise noted.

BICM 81000 - SEMINAR IN BIOCHEMISTRY
15 hours, (1 credit)
Three semesters required of all students.

BICM 82000 - DOCTORAL DISSERTATION RESEARCH Credits variable
Prerequisite: The First Examination.

BICM 83000 - BIOCHEMISTRY OF LIPIDS AND MEMBRANES
Purification and physical characterization of lipids and membrane proteins; bilayer properties, lipid dynamics, transport proteins and energy, cytoskeletal membrane proteins; receptors; membrane-bound enzymes; signal in cells; membrane biogenesis.

BICM 84000 - ENZYMEOLOGY
Purification of enzymes; kinetic and structural properties; mechanism of action; studies of active sites; regulation of catalytic activity.

BICM 85000 - NUCLEIC ACID METABOLISM AND FUNCTION
Current views on the molecular structure of DNA and RNA, their biosynthesis and degradation, their functional role in protein synthesis and in development.

BICM 86000 - METABOLIC PATHWAYS AND THEIR CONTROL MECHANISMS
The major metabolic pathways in plants, animals, and microorganisms; multienzyme systems and some mathematical models applicable to them; mechanisms of regulation such as enzymic induction and feedback inhibition.

BICM 87000 - BIOINFORMATICS
The use of bioinformatic methods to study the properties of biological macromolecules including proteins, carbohydrates, lipids, cofactors, and nucleic acids. Concentration on visualization of structures and evolutionary relationships of biologically interesting molecules.

BICM 88800 - CURRENT TOPICS IN BIOCHEMISTRY 15 hours, (1 credit)
Recent advances in selected areas of biochemistry will be presented.

BICM 88900 - SPECIAL TOPICS IN BIOCHEMISTRY
Lectures dealing with specialized topics or recent advances in the field.

BICM 90000 - DISSERTATION SUPERVISION (1 credit)
Required of all students.
Prerequisite: Completion of all required courses.
Areas of faculty research interest include:

- Biochemical pharmacology
- Bioenergetics
- Bioinformatics
- Bioinorganic chemistry
- Bioorganic chemistry
- Biotechnology/biomaterials
- Enzymology and protein biochemistry
- Immunochemistry
- Lipid chemistry
- Membrane structure, function, and transport
- Metabolism and regulation
- Molecular biology
- Neurochemistry
- Organelle biochemistry
- Physical biochemistry/biophysical chemistry
- Structural Biology

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