Biological Chemistry

Department Website: https://chemistry.uchicago.edu/

Program of Study

The Department of Chemistry, in conjunction with the Department of Biochemistry and Molecular Biology (BCMB) in the Division of the Biological Sciences, offers a BS degree in Biological Chemistry. The program is designed to prepare students to enter a variety of interdisciplinary fields in biochemical and biophysical sciences. Undergraduate research is strongly encouraged. By combining resources of both departments, students in this program are given the opportunity to study chemistry and physics of macromolecules, mechanisms of actions of enzymes and hormones, molecular and cellular biology, biotechnology, and other related fields.

Summary of Requirements

GENERAL EDUCATION		
CHEM 11100-11200	Comprehensive General Chemistry I-II [†*‡]	200
One of the following sequences:		200
MATH 15100-15200	Calculus I-II	
MATH 16100-16200	Honors Calculus I-II [†]	
MATH 13100-13200	Elementary Functions and Calculus I-II (MATH 15000s or higher is strongly recommended)	
BIOS 20186	Fundamentals of Cell and Molecular Biology [**]	100
BIOS 20187	Fundamentals of Genetics (or AP credit, if an AP 5 Fundamentals Sequence is completed) [†**]	100
Total Units		600
MAJOR		
One of the following: [†*]		100
CHEM 11300	Comprehensive General Chemistry III	
CHEM 12300	Honors General Chemistry III	
MATH 18300-18400-18500	Mathematical Methods in the Physical Sciences I-II-III [§]	300
CHEM 20100	Inorganic Chemistry	100
PHYS 12100-12200-12300	General Physics I-II-III (or higher)	300
One of the following sequences:		300
CHEM 22000-22100-22200	Organic Chemistry I-II-III	
CHEM 23000-23100-23200	Honors Organic Chemistry I-II-III	
CHEM 26100 & CHEM 26200	Introductory Quantum Mechanics and Thermodynamics	200
CHEM 26700	Experimental Physical Chemistry	100
One of the following:		100
CHEM 20200	Organometallic Chemistry	
CHEM 20300	Chemistry of Materials	
CHEM 23300	Introduction to Chemical Biology	
CHEM 26300	Chemical Kinetics and Dynamics	
BIOS 20200	Introduction to Biochemistry	100
BIOS 21317	Topics in Biological Chemistry	100
One of the following:		100
BIOS 21229	Genome Informatics: How Cells Reorganize Genomes	
BIOS 21237	Developmental Mechanisms	
BIOS 21238	Cell Biology II	
BIOS 21249	Organization, Expression, and Transmission of Genome Information	
BIOS 21306	Human Genetics and Evolution	
BIOS 21328	Biophysics of Biomolecules	
BIOS 21349	Protein Structure and Functions in Medicine	
BIOS 21358	Simulation, Modeling, and Computation in Biophysics	
BIOS 21360	Advanced Molecular Biology	

BIOS 21510	Chromatin & Epigenetics	
One approved 30000-level Biochemistry or Chemistry course ±		100
Total Units		1900

† Credit may be granted by examination.

* See following sections on Chemistry Placement Test, Advanced Placement Credit, and Optional Chemistry Advanced Placement Exam. Note that no credit is given for IB chemistry.

‡ CHEM 10100-CHEM 10200 Introductory General Chemistry I-II and CHEM 12100-CHEM 12200 Honors General Chemistry I-II also satisfy this requirement. Enrollment into a particular sequence is based on students' Chemistry Placement Test score.

** Chemistry and Biological Chemistry majors can take these courses without the Biological Sciences prerequisites (BIOS 20153-20151), unless they pursue a double major in the Biological Sciences. They are expected to show competency in mathematical modeling of biological phenomena covered in BIOS 20151. Students who successfully complete BIOS 20234, BIOS 20235, and BIOS 20236 can substitute for BIOS 20186 and BIOS 20187.

+ Students with a score of 5 on the AP Biology exam receive one credit. They are eligible to register for a three-quarter AP 5 Fundamentals Sequence. Upon completion of the sequence, students receive an additional AP credit, for a total of two, to meet the general education requirement. Students majoring in Biological Chemistry will count the AP 5 Fundamentals Sequence as three electives.

§ The sequence MATH 18300-18400-18500 Mathematical Methods in the Physical Sciences I-II-III is the recommended course of study for Chemistry majors. Students who switch into the major later in their studies may also substitute MATH 15300/16300, MATH 19620, MATH 20250, or STAT 24300 for MATH 18300. Students who wish to double major or minor in Mathematics may consider alternative substitutions. The three-quarter sequence MATH 20300-20400-20500 (http://collegecatalog.uchicago.edu/search/?P=MATH%2020300-20400-20500) Analysis in Rn I-II-III or the honors variation of this sequence (MATH 20700-20800-20900 Honors Analysis in Rn I-II-III) may be substituted for MATH 18400 (http://collegecatalog.uchicago.edu/search/?P=MATH%2018400)-MATH 18500 Mathematical Methods in the Physical Sciences II-III; please note that MATH 20250 (http://collegecatalog.uchicago.edu/search/?P=MATH%2020250) Abstract Linear Algebra or STAT 24300 (http://collegecatalog.uchicago.edu/search/?P=STAT%2024300) Numerical Linear Algebra is a prerequisite for MATH 20400. MATH 18600 (http://collegecatalog.uchicago.edu/search/?P=MATH%2019620) is recommended for Chemistry majors who plan to pursue advanced study in physical chemistry.

± These courses must be chosen in consultation with the Director of Undergraduate Studies; their approval must be conveyed to the student's College adviser for proper documentation. These are graduate-level courses. In Chemistry, these include any course with a 30000-level designation. In Biology, the course must be at the graduate level, or have sufficient differentiation between undergraduate- and graduate-level work to qualify as a graduate-level course for courses which have both undergraduate and graduate students enrolled. In general, this course must have a significant molecular or chemical component.

Chemistry Placement Test

The Chemistry Placement Test, taken online in the summer via Canvas (https://canvas.uchicago.edu/), is required for all first-year and transfer students intending to enroll in General, Honors, or Introductory Chemistry. Without a Chemistry Placement Test score, students will not be able to pre-register for Chemistry courses. The Mathematics Placement Test is also required for students' Chemistry placement. After the Chemistry Placement Test is scored, the results will be visible in the Student Portal (https://my.uchicago.edu/). For more information on placement examinations, please consult the New Student Advising (https://college.uchicago.edu/new-student-advising/placement-ap-tests/) website.

Advanced Placement Credit

Students who earn a score of 5 on the Advanced Placement (AP) Examination in Chemistry are still required to take the Chemistry Placement Test. Students with an AP score of 5 in Chemistry are given credit for CHEM 11100 Comprehensive General Chemistry I. Students who receive this credit through AP have two options:

1. Take CHEM 12200 Honors General Chemistry II in the Winter Quarter. (Students considering CHEM 12200 are strongly encouraged to self-review material prior to starting the course.)
2. Forfeit their AP credit and take CHEM 11100 Comprehensive General Chemistry I or CHEM 12100 Honors General Chemistry I in the Autumn Quarter.

Note that no credit is given for IB Chemistry, but students may pursue the Chemistry Advanced Placement option described below.

Optional Chemistry Advanced Placement Exam

First-year and transfer students with a strong Chemistry background (i.e., those who place into CHEM 12100 Honors General Chemistry I on the Chemistry Placement Test) will automatically be registered to take the Chemistry Advanced Placement Exam (CAPE). This exam is optional. The CAPE is offered online via Canvas (https://canvas.uchicago.edu/) only at the time of matriculation. All students will receive an email later in the

summer outlining how to sit for the CAPE. Performing well on this exam and consulting with the Chemistry Director of Undergraduate Studies (DUS) (chem-dus@lists.uchicago.edu), may qualify a student to place out of General Chemistry and into more advanced courses such as CHEM 22000 Organic Chemistry I, CHEM 20100 Inorganic Chemistry, or CHEM 26100 Introductory Quantum Mechanics.

If a student is approved to pursue this option, back credit will be assigned for CHEM 11100-11200-11300 Comprehensive General Chemistry I-II-III when any the following three courses have been completed:

- CHEM 23300 Introduction to Chemical Biology
- CHEM 26100-26200-26300 Quantum Mechanics; Thermodynamics; Chemical Kinetics and Dynamics
- CHEM 20100-20200 Inorganic Chemistry I-II
- CHEM 20300 Chemistry of Materials
- CHEM 26700 Experimental Physical Chemistry
- CHEM 22700 Advanced Organic/Inorganic Laboratory
- CHEM 26800 Quantum Molecular and Materials Modeling

This advanced placement track may fast-track well-prepared students who wish to advance their studies into the various sub-fields of Chemistry, students who wish to double major or minor in Chemistry, or non-Chemistry majors who wish to enroll in advanced courses that require General Chemistry as a prerequisite.

Joint Degree Program

Students who achieve advanced academic standing through their performance on placement examinations or accreditation examinations may consider the formulation of a four-year degree program that leads to the concurrent award of the Joint BS in Biological Chemistry and MS in Chemistry (https://chemistry.uchicago.edu/joint-bsms-degree-program/). For more information, consult Vera Dragisich at vdragisi@uchicago.edu or the Department of Chemistry at chem-dus@lists.uchicago.edu.

Undergraduate Research and Honors

Students majoring in Biological Chemistry are strongly encouraged to participate in research with a faculty member (https://chemistry.uchicago.edu/faculty/). Research can be either independent or taken for course credit. To participate in research coursework, a student is required to have the consent of a faculty sponsor and the Director of Undergraduate Studies (DUS) (chem-dus@lists.uchicago.edu), and to submit the College Reading/Research Course Form (https://humanities-web.s3.us-east-2.amazonaws.com/college-prod/s3fs-public/documents/College%20Reading%20&%20Research%20Form%20Fillable.pdf). For more information on research opportunities. the Honors Program in Biological Chemistry, and/or how to fill out the College Reading/Research Course Form, please visit the Department of Chemistry website (https://chemistry.uchicago.edu/undergraduate-chemistry-major-and-research/).

Excellent students who pursue a substantive research project with a faculty member in the Department of Chemistry or the Department of Biochemistry and Molecular Biology should plan to submit an honors thesis based on their work. Honors thesis work constitutes a sustained, and in many cases multi-year, project, with students typically beginning no later than their third year and continuing through the following summer and their fourth year. Students who wish to be considered for honors are expected to complete their arrangements with the Director of Undergraduate Studies (DUS) (chem-dus@lists.uchicago.edu) before the end of their third year and to register for one quarter of CHEM 29900 Advanced Research in Chemistry or one year of CHEM 29600 Research in Chemistry during their third or fourth years.

To be eligible to receive honors, students in the BS degree program in Biological Chemistry must write a creditable honors paper describing their research. The paper must be submitted before the deadline established by the Director of Undergraduate Studies (DUS) (chem-dus@lists.uchicago.edu) and must be approved by the Department of Chemistry and the Department of Biochemistry and Molecular Biology. In addition, an oral presentation of the research is required. The research paper or project used to meet this requirement may not be used to meet the BA paper or project requirement in another major.

To earn a BS degree with honors in Biological Chemistry, students must also have an overall GPA of 3.0 or higher.

Grading

Chemistry and Biological Chemistry Majors:

Students majoring in Chemistry and/or Biological Chemistry must earn (1) a major GPA of 2.0 or higher, (2) a C average or higher in the General Chemistry sequence, and (3) a C– or higher in all courses required by the Chemistry major, including those courses counting toward general education requirements in the mathematical and physical sciences.

Nonmajors:

Nonmajors can continue onto the next course in the General Chemistry sequence if they receive a letter grade higher than an F. An average grade of C or higher in the General Chemistry sequence, CHEM 10100-CHEM 10200-CHEM 11300 or CHEM 11100-11200-11300 Comprehensive General Chemistry I-II-III

or CHEM 12100-12200-12300 Honors General Chemistry I-II-III, is a prerequisite for enrollment in Organic Chemistry. If you do not meet these criteria, please contact the Director of Undergraduate Studies (DUS) (chem-dus@lists.uchicago.edu). Nonmajors may also take Chemistry courses on a P/F basis.

Laboratory Safety

In chemistry labs, safety goggles must be worn at all times. Students who require prescriptive lenses may wear prescription glasses under goggles; contact lenses may not be worn. Exceptions for medical reasons must be obtained from the lab director.