BACHELOR OF SCIENCE WITH A MAJOR IN CHEMISTRY (STEM)

Students in GW's bachelor of science in chemistry program study problems of critical importance to the world while engaging in cutting-edge research alongside expert faculty and graduate students. The program provides a hands-on approach to modern laboratory practices and instrumentation supported by curricula in analytical, inorganic, organic, and physical chemistry. Pairing academic rigor with rich research in the nation's capital, students graduate with the expertise to pursue opportunities in a variety of areas. Chemistry is a powerful springboard to rich and rewarding careers, from patent law and medicine, pharmacology and pharmacy, clinical and forensic laboratories, to material science or academics.

This is a STEM designated program.

Visit the program website (https://chemistry.columbian.gwu.edu/) for additional information.

ADMISSIONS

For information about the admission process, including deadlines, visit the Office of Undergraduate Admissions website (https://undergraduate.admissions.gwu.edu/). Applications can be submitted via the Common Application (https://go.gwu.edu/commonapp/).

Supporting documents not submitted online should be mailed to:

Office of Undergraduate Admissions
The George Washington University
800 21st St NW Suite 100
Washington, DC 20052

For questions visit undergraduate.admissions.gwu.edu/contact-us (http://undergraduate.admissions.gwu.edu/contact-us/).

OPTION 1

The Department of Chemistry offers four options for a bachelor of science degree, all designed to give students a broad background in the basic divisions of chemistry: analytical, biochemistry, inorganic, organic, and physical.

Option 1 provides considerable concentration in chemistry while permitting a wider selection of electives. It should meet the needs of students preparing to enter the fields of medicine, law, dentistry, and business, among others.

The following requirements must be fulfilled: The general requirements stated under Columbian College of Arts and Sciences, Undergraduate Programs (https://bulletin.gwu.edu/arts-sciences/#degreeregulationstext) and the required curriculum.

Code	Title	Credits
Prerequisite courses for the bachelor of science degree:		
CHEM 1111 & CHEM 1112	General Chemistry I and General Chemistry II	
CHEM 2122 & CHEM 2123W	Introductory Quantitative Analysis and Introductory Quantitative Analysis Laboratory	
MATH 1231	Single-Variable Calculus I	
or MATH 1220 & MATH 1221	Calculus with Precalculus I and Calculus with Precalculus II	
MATH 1232	Single-Variable Calculus II	
PHYS 1021	University Physics I	
or PHYS 1025	University Physics I with Biological Applications	
PHYS 1022	University Physics II	
or PHYS 1026	University Physics II with Biological Applications	
Two additional semesters of approved coursework in the natural sciences or mathematics, such as one of the following:		
BISC 1111	Introductory Biology: Cells and Molecules	
BISC 1112	Introductory Biology: The Biology of Organisms	
GEOL 1001	Physical Geology *	
or GEOL 1005	Environmental Geology	
GEOL 1002	Historical Geology	

*Credit toward the degree cannot be earned for both GEOL 1001 and GEOL 1005.

Code	Title	Credits
Required courses:		
CHEM 2151 & CHEM 2153	Organic Chemistry I and Organic Chemistry Laboratory I	
CHEM 2152 & CHEM 2154	Organic Chemistry II and Organic Chemistry Laboratory II	
CHEM 3171 & CHEM 3172	Physical Chemistry I and Physical Chemistry II	
CHEM 3173	Physical Chemistry Laboratory	
CHEM 3165	Biochemistry I	

CHEM 4122	Instrumental Analytical Chemistry
CHEM 4134	Inorganic Chemistry

Suggested Program of Study:

Students should follow this sequence in general and are urged to consult with the chemistry and premedical advisors concerning their academic program.

Code	Title	Credits
First Year		
CHEM 1111	General Chemistry I	
CHEM 1112	General Chemistry II	
MATH 1231	Single-Variable Calculus I	
or MATH 1220 & MATH 1221	Calculus with Precalculus I and Calculus with Precalculus II	
MATH 1232	Single-Variable Calculus II	
Second Year		
CHEM 2122	Introductory Quantitative Analysis	
CHEM 2151	Organic Chemistry I	
CHEM 2153	Organic Chemistry Laboratory I	
CHEM 2152	Organic Chemistry II	
CHEM 2154	Organic Chemistry Laboratory II	
PHYS 1021	University Physics I	
or PHYS 1025	University Physics I with Biological Applications	
PHYS 1022	University Physics II	
or PHYS 1026	University Physics II with Biological Applications	
MATH 1232	Single-Variable Calculus II (if not taken in the first year)	
Third Year		
CHEM 2123	Introductory Quantitative Analysis Laboratory	
CHEM 3171	Physical Chemistry I	
CHEM 3172	Physical Chemistry II	
CHEM 3173	Physical Chemistry Laboratory	
Fourth Year		
CHEM 3165	Biochemistry I (if not taken in the third year)	
CHEM 4122	Instrumental Analytical Chemistry	
CHEM 4134	Inorganic Chemistry (if not taken in the third year)	

OPTION 2

The Department of Chemistry offers four options for bachelor of science degree, all designed to give students a broad background in the basic divisions of chemistry: analytical, biochemistry, inorganic, organic, and physical.

Option 2 is for students preparing for graduate study in chemistry or those planning to enter the chemical profession and wishing to be certified by the American Chemical Society as having met the minimum requirements for professional training.

The following requirements must be fulfilled:

The general requirements stated under Columbian College of Arts and Sciences, Undergraduate Programs (https://bulletin.gwu.edu/arts-sciences/#degreeregulationstext) and the required curriculum.

Code	Title	Credits
Prerequisite courses for the bachelor of science degree:		
CHEM 1111 & CHEM 1112	General Chemistry I and General Chemistry II	
CHEM 2122 & CHEM 2123W	Introductory Quantitative Analysis and Introductory Quantitative Analysis Laboratory	
MATH 1231	Single-Variable Calculus I	
or MATH 1220 & MATH 1221	Calculus with Precalculus I and Calculus with Precalculus II	
MATH 1232	Single-Variable Calculus II	
PHYS 1021	University Physics I	
or PHYS 1025	University Physics I with Biological Applications	
PHYS 1022	University Physics II	
or PHYS 1026	University Physics II with Biological Applications	
Two additional semesters of approved coursework in the natural sciences or mathematics, such as one of the following:		
BISC 1111	Introductory Biology: Cells and Molecules	
BISC 1112	Introductory Biology: The Biology of Organisms	
GEOL 1001	Physical Geology *	
or GEOL 1005	Environmental Geology	

GEOL 1002	Historical Geology

*Credit toward the degree cannot be earned for both GEOL 1001 and GEOL 1005.

Code	Title	Credits
Required courses:		
CHEM 2151 & CHEM 2153	Organic Chemistry I and Organic Chemistry Laboratory I	
CHEM 2152 & CHEM 2154	Organic Chemistry II and Organic Chemistry Laboratory II	
CHEM 3171 & CHEM 3172	Physical Chemistry I and Physical Chemistry II	
CHEM 3173	Physical Chemistry Laboratory	
CHEM 3165	Biochemistry I	
CHEM 4122	Instrumental Analytical Chemistry	
CHEM 4123	Instrumental Analytical Chemistry Laboratory	
CHEM 4134	Inorganic Chemistry	
CHEM 4195	Undergraduate Research (Research for credit, either CHEM 4195 or CHEM 4195W, may begin as early as second year)	
or CHEM 4195W	Undergraduate Research	

A course in a structured computer programming language is recommended

Suggested Program of Study:

Students should follow this sequence in general and are urged to consult with the chemistry and premedical advisors concerning their academic program.

Code	Title	Credits
First Year		
CHEM 1111	General Chemistry I	
CHEM 1112	General Chemistry II	
MATH 1231	Single-Variable Calculus I	
or MATH 1220 & MATH 1221	Calculus with Precalculus I and Calculus with Precalculus II	
MATH 1232	Single-Variable Calculus II	
Second Year		
CHEM 2122	Introductory Quantitative Analysis	
CHEM 2151	Organic Chemistry I	
CHEM 2153	Organic Chemistry Laboratory I	
CHEM 2152	Organic Chemistry II	
CHEM 2154	Organic Chemistry Laboratory II	
PHYS 1021	University Physics I	
or PHYS 1025	University Physics I with Biological Applications	
PHYS 1022	University Physics II	
or PHYS 1026	University Physics II with Biological Applications	
MATH 1232	Single-Variable Calculus II (if not taken in the first year)	
Third Year		
CHEM 2123	Introductory Quantitative Analysis Laboratory	
CHEM 3171	Physical Chemistry I	
CHEM 3172	Physical Chemistry II	
CHEM 3173	Physical Chemistry Laboratory	
Fourth Year		
CHEM 3165	Biochemistry I	
CHEM 4122	Instrumental Analytical Chemistry	
CHEM 4123	Instrumental Analytical Chemistry Laboratory	
CHEM 4134	Inorganic Chemistry (if not taken in the third year)	

Students are encouraged to consider 6000-level CHEM courses in consultation with their advisor.

OPTION 3

The Department of Chemistry offers four options for bachelor of science degree, all designed to give students a broad background in the basic divisions of chemistry: analytical, biochemistry, inorganic, organic, and physical.

Option 3 prepares students to meet the needs of federal and state forensic sciences laboratories.

The following requirements must be fulfilled:

The general requirements stated under Columbian College of Arts and Sciences, Undergraduate Programs (https://bulletin.gwu.edu/arts-sciences/#degreeregulationstext) and the required curriculum.

Code	Title	Credits
Prerequisite courses		
CHEM 1111 & CHEM 1112	General Chemistry I and General Chemistry II	
CHEM 2122 & CHEM 2123W	Introductory Quantitative Analysis and Introductory Quantitative Analysis Laboratory	
MATH 1231	Single-Variable Calculus I	
or MATH 1220 & MATH 1221	Calculus with Precalculus I and Calculus with Precalculus II	
MATH 1232	Single-Variable Calculus II	
PHYS 1021	University Physics I	
or PHYS 1025	University Physics I with Biological Applications	
PHYS 1022	University Physics II	
or PHYS 1026	University Physics II with Biological Applications	

Code	Title	Credits
Required courses		
CHEM 2151 & CHEM 2153	Organic Chemistry I and Organic Chemistry Laboratory I	
CHEM 2152 & CHEM 2154	Organic Chemistry II and Organic Chemistry Laboratory II	
CHEM 3171 & CHEM 3172	Physical Chemistry I and Physical Chemistry II	
CHEM 3173	Physical Chemistry Laboratory	
CHEM 3165	Biochemistry I	
CHEM 4122	Instrumental Analytical Chemistry	
CHEM 4134	Inorganic Chemistry	
BISC 1111	Introductory Biology: Cells and Molecules ‡	
BISC 1112	Introductory Biology: The Biology of Organisms	
Choose any four 6000-level FORS courses in consultation with a Forensic Sciences advisor. Students may begin taking certain FORS courses after completion of CHEM 2152.		

Suggested Program of Study:

Students should follow this sequence in general and are urged to consult with the chemistry and premedical advisors concerning their academic program.

Code	Title	Credits
First Year		
CHEM 1111	General Chemistry I	
CHEM 1112	General Chemistry II	
MATH 1231	Single-Variable Calculus I	
or MATH 1220 & MATH 1221	Calculus with Precalculus I and Calculus with Precalculus II	
MATH 1232	Single-Variable Calculus II	
BISC 1111	Introductory Biology: Cells and Molecules (may be taken in the second year instead)	
BISC 1112	Introductory Biology: The Biology of Organisms (may be taken in the second year instead)	
Second Year		
CHEM 2122	Introductory Quantitative Analysis	
CHEM 2151	Organic Chemistry I	
CHEM 2153	Organic Chemistry Laboratory I	
CHEM 2152	Organic Chemistry II	
CHEM 2154	Organic Chemistry Laboratory II	
PHYS 1021	University Physics I (may be taken in the first year instead)	
or PHYS 1025	University Physics I with Biological Applications	
PHYS 1022	University Physics II (may be taken in the first year instead)	
or PHYS 1026	University Physics II with Biological Applications	
MATH 1232	Single-Variable Calculus II (if not taken in the first year)	
Third Year		
CHEM 2123	Introductory Quantitative Analysis Laboratory	
CHEM 3171	Physical Chemistry I	
CHEM 3172	Physical Chemistry II	
CHEM 3173	Physical Chemistry Laboratory	
Fourth Year		
CHEM 3165	Biochemistry I	
CHEM 4122	Instrumental Analytical Chemistry	

CHEM 4123	Instrumental Analytical Chemistry Laboratory
CHEM 4134	Inorganic Chemistry (if not taken in the third year)

OPTION 4

The Department of Chemistry offers four options for bachelor of science degree, all designed to give students a broad background in the basic divisions of chemistry: analytical, biochemistry, inorganic, organic, and physical.

Option 4 includes additional courses in biochemistry and fulfills the American Chemical Society requirement for a certified degree program in chemistry with a biochemistry option.

The following requirements must be fulfilled:

The general requirements stated under Columbian College of Arts and Sciences, Undergraduate Programs (https://bulletin.gwu.edu/arts-sciences/#degreeregulationstext) and the required curriculum.

Code	Title	Credits
Prerequisite courses for the bachelor of science degree:		
BISC 1111	Introductory Biology: Cells and Molecules ‡	
BISC 1112	Introductory Biology: The Biology of Organisms	
CHEM 1111	General Chemistry I	
CHEM 1112	General Chemistry II	
CHEM 2122	Introductory Quantitative Analysis	
CHEM 2123W	Introductory Quantitative Analysis Laboratory	
MATH 1231	Single-Variable Calculus I	
or MATH 1220 & MATH 1221	Calculus with Precalculus I and Calculus with Precalculus II	
MATH 1232	Single-Variable Calculus II	
PHYS 1021	University Physics I	
or PHYS 1025	University Physics I with Biological Applications	
PHYS 1022	University Physics II	
or PHYS 1026	University Physics II with Biological Applications	

Code	Title	Credits
Required courses:		
CHEM 2151 & CHEM 2153	Organic Chemistry I and Organic Chemistry Laboratory I	
CHEM 2152 & CHEM 2154	Organic Chemistry II and Organic Chemistry Laboratory II	
CHEM 3171 & CHEM 3172	Physical Chemistry I and Physical Chemistry II	
CHEM 3173	Physical Chemistry Laboratory	
CHEM 3165 & CHEM 3166	Biochemistry I and Biochemistry II (BIOC/BISC equivalents may be substituted)	
CHEM 3262	Biochemistry Laboratory (BIOC/BISC equivalent may be substituted)	
CHEM 4122	Instrumental Analytical Chemistry	
CHEM 4123	Instrumental Analytical Chemistry Laboratory	
CHEM 4134	Inorganic Chemistry	
CHEM 4195	Undergraduate Research (Research for credit, either CHEM 4195 or CHEM 4195W, may begin as early as second year)	
or CHEM 4195W	Undergraduate Research	
The following are recommended:		
BISC 2202	Cell Biology	
BISC 2207	Genetics	
BISC 2322	Human Physiology	

Suggested Program of Study:

Students should follow this sequence in general and are urged to consult with the chemistry and premedical advisors concerning their academic program.

Code	Title	Credits
First Year		
CHEM 1111	General Chemistry I	
CHEM 1112	General Chemistry II	
MATH 1231	Single-Variable Calculus I	
or MATH 1220 & MATH 1221	Calculus with Precalculus I and Calculus with Precalculus II	

MATH 1232	Single-Variable Calculus II
BISC 1111	Introductory Biology: Cells and Molecules (may be taken in the second year instead)
BISC 1112	Introductory Biology: The Biology of Organisms (may be taken in the second year instead)
Second Year	
CHEM 2122	Introductory Quantitative Analysis
CHEM 2151	Organic Chemistry I
CHEM 2153	Organic Chemistry Laboratory I
CHEM 2152	Organic Chemistry II
CHEM 2154	Organic Chemistry Laboratory II
PHYS 1021	University Physics I (may be taken in the first year instead)
or PHYS 1025	University Physics I with Biological Applications
PHYS 1022	University Physics II (may be taken in the first year instead)
or PHYS 1026	University Physics II with Biological Applications
MATH 1232	Single-Variable Calculus II (if not taken in the first year)
Third Year	
CHEM 2123W	Introductory Quantitative Analysis Laboratory
CHEM 3165	Biochemistry I
CHEM 3166W	Biochemistry II
CHEM 3171	Physical Chemistry I
CHEM 3172	Physical Chemistry II
CHEM 3173	Physical Chemistry Laboratory
Fourth Year	
CHEM 4122	Instrumental Analytical Chemistry
CHEM 4123	Instrumental Analytical Chemistry Laboratory
CHEM 4134	Inorganic Chemistry (if not taken in the third year)
CHEM 3262	Biochemistry Laboratory

Students are encouraged to consider 6000-level CHEM courses in consultation with their advisor.

GENERAL EDUCATION

In addition to the University General Education Requirement (https://bulletin.gwu.edu/university-regulations/general-education/), undergraduate students in Columbian College must complete a further, College-specific general education curriculum —Perspective, Analysis, Communication (G-PAC) (https://bulletin.gwu.edu/arts-sciences/gpac/) as well as the course CCAS 1001 First-Year Experience. Together with the University General Education Requirement, G-PAC engages students in active intellectual inquiry across the liberal arts. Students achieve a set of learning outcomes that enhance their analytical skills, develop their communication competencies, and invite them to participate as responsible citizens who are attentive to issues of culture, diversity, and privilege.

Coursework **(**https://bulletin.gwu.edu/university-regulations/general-education/#generaleducationtext**) for the University General Education Requirement is distributed as follows:**

- One course in critical thinking in the humanities.
- Two courses in critical thinking, quantitative reasoning, or scientific reasoning in the social sciences.
- One course that has an approved oral communication component.
- One course in quantitative reasoning (must be in mathematics or statistics).
- One course in scientific reasoning (must be in natural and/or physical laboratory sciences).
- UW 1020 (https://bulletin.gwu.edu/search/?P=UW%201020) University Writing (4 credits).
- After successful completion of UW 1020**,** 6 credits distributed over at least two writing in the discipline (WID) courses taken in separate semesters. WID courses are designated by a "W" appended to the course number.

Coursework for the CCAS G-PAC requirement is distributed as follows:

- Arts—one approved arts course that involves the study or creation of artwork based on an understanding or interpretation of artistic traditions or knowledge of art in a contemporary context.
- Global or cross-cultural perspective—one approved course that analyzes the ways in which institutions, practices, and problems transcend national and regional boundaries.
- Local or civic engagement—one approved course that develops the values, ethics, disciplines, and commitment to pursue responsible public action.
- Natural or physical science—one additional approved laboratory course that employs the process of scientific inquiry (in addition

to the one course in this category required by the University General Education Requirement).

- Humanities—one additional approved humanities course that involves critical thinking skills (in addition to the one course in this category required by the University General Education Requirement).
- CCAS 1001 First-Year Experience

Certain courses are approved to fulfill GPAC requirements in more than one category.

Courses taken in fulfillment of G-PAC requirements may also be counted toward majors or minors. Transfer courses taken prior to, but not after, admission to George Washington University may count toward the University General Education Requirement and G-PAC, if those transfer courses are equivalent to GW courses that have been approved by the University and the College.

Lists of approved courses in the above categories are included on each undergraduate major's (https://bulletin.gwu.edu/arts-sciences/#majorstext) page in this Bulletin.

SPECIAL HONORS

In addition to meeting the general requirements stated under University Regulations, a candidate for graduation with Special Honors in chemistry must maintain a cumulative 3.0 grade-point average in chemistry courses and take CHEM 4195 or CHEM 4195W for at least 3 credits over two semesters. In addition to the final report required for CHEM 4195 or CHEM 4195W, a poster or oral presentation is required.

COMBINED PROGRAMS

Combined programs

- Dual Bachelor of Science with a major in chemistry and Master of Forensic Sciences with a concentration in forensic chemistry (https://bulletin.gwu.edu/arts-sciences/chemistry/combined-bs-mfs-forensic-chemistry/)
- Dual Bachelor of Science with a major in chemistry and Master of Science in the field of environmental and green chemistry (https://bulletin.gwu.edu/arts-sciences/chemistry/combined-bs-ms-environmental-green-chemistry/)