

# 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) (<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 (<http://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 (<http://bulletin.gwu.edu/arts-sciences/#degreeregulationtext>) 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 (<http://bulletin.gwu.edu/arts-sciences/#degreeregulationtext>) and the required curriculum.

| Code                        | Title  | Credits |
|-----------------------------|--|---------|
| <b>Prerequisite courses</b> |  |         |
| 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 |
|--------------------------|--|---------|
| <b>First Year</b>        |  |         |
| 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 (<http://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) |
| <b>Second Year</b> |  |
| 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)                             |
| <b>Third Year</b>  |  |
| 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  |
| <b>Fourth Year</b> |  |
| 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 (<http://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://advising.columbian.gwu.edu/general-education-curriculum-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 (<http://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 (<http://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 (<http://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 (<http://bulletin.gwu.edu/arts-sciences/chemistry/combined-bs-ms-environmental-green-chemistry/>)