## Chemistry

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## Majors

## The Major in Chemistry

## Total units required: 53

Required courses: To prepare for a major in chemistry, students will take the following:

| Code | Title | Units |
| :--- | :--- | ---: |
| Chem 111A | General Chemistry I | 3 |
| Chem 112A | General Chemistry II | 3 |
| Chem 151 | General Chemistry Laboratory I | 2 |
| Chem 152 | General Chemistry Laboratory II | 2 |
| Chem 261 | Organic Chemistry I with Lab | 4 |
| Chem 262 | Organic Chemistry II with Lab | 4 |
| Math 131 | Calculus I | 3 |
| Physics 191 | Physics I | 3 |
| Physics 191L | Physics I Laboratory | 1 |
| Physics 192 | Physics II | 3 |
| Physics 192L | Physics II Laboratory | 1 |
| Math 132 | Calculus II | 3 |
| Math 233 | Calculus III | 3 |
| Total Units |  | $\mathbf{3 5}$ |

Note: In certain instances, students may substitute Chem 105 Introductory General Chemistry I and Chem 106 Introductory General Chemistry II for Chem 111A General Chemistry I and Chem 112A General Chemistry II. Please consult the department's director of undergraduate studies for details.
Majors in chemistry must take a minimum of 18 units of advanced courses in chemistry or biochemistry, among which the following must be included:

| Code | Title | Units |
| :--- | :--- | ---: |
| Chem 401 | Physical Chemistry I | 3 |
| Chem 402 | Physical Chemistry II | 3 |
| Chem 461 | Inorganic Chemistry | 3 |
| Total Units |  | $\mathbf{9}$ |

In addition, 9 units in chemistry at the 300 level or above must be taken (not including Chem 490 Introduction to Research or Chem 495 Advanced Undergraduate Research in Chemistry). Biol 451 General Biochemistry may be used to complete 3 of the required 9 units.

At least 3 of these 9 advanced units must be in a laboratory course chosen from the following list:

| Code | Title | Units |
| :--- | :--- | ---: |
| Chem 358 | Organic Chemistry Laboratory II | 4 |
| Chem 435 | Nuclear and Radiochemistry Lab | 3 |
| Chem 445 | Instrumental Methods: Physical Chemistry | 3 |
| Chem 462 | Synthetic Polymer Chemistry Laboratory | 3 |
| Chem 470 | Inorganic Chemistry Laboratory | 3 |

Physics 217 Introduction to Quantum Physics and additional mathematics courses are also recommended. Chem 181 First-Year Opportunity: Applications in Chemistry, a seminar to introduce firstyear students to research activities in the department, is optional. A working knowledge of computer programming and of a foreign language, such as German or Russian, is encouraged but not required.

Students have the advantage of planning their programs with their advisors in accordance with their personal interests. Some graduate courses are also available to seniors.

All chemistry course work must be taken in residence at Washington University to be applied toward the chemistry major. A minimum grade of C- must be earned in each course to count toward the chemistry major.

Note: Per the College of Arts \& Sciences guidelines, for students who also pursue a minor or more than one major or minor program, only introductory (100- and 200-level) courses may be counted, when relevant, toward the requirements of both programs. All advanced (300- and 400-level) courses must be unique to each program. In other words, no advanced course may be "double-counted" for the course work needed to fulfill either program's minimal requirements. Should a student's major and minor programs require the same course, a departmentally sanctioned elective must be chosen to replace the course in one of the programs.

## The Major With a Concentration in Biochemistry

## Total units required: 59

Chemistry majors with a concentration in biochemistry should add Biol 2960 Principles of Biology I and Biol 2970 Principles of Biology II as prerequisites to the major and specify a minimum of 18 units in advanced courses in biology and chemistry, among which the following must be included:

| Code | Title | Units |
| :--- | :--- | ---: |
| Chem 481 | General Biochemistry I | 3 |
| Chem 482 | General Biochemistry II | 3 |
| Chem 401 | Physical Chemistry I | 3 |
| Chem 402 | Physical Chemistry II | 3 |
| Chem 461 | Inorganic Chemistry | 3 |
| Total Units |  | $\mathbf{1 5}$ |

In addition, at least one advanced lab must be chosen from the following list:

| Code | Title | Units |
| :--- | :--- | ---: |
| Chem 358 | Organic Chemistry Laboratory II | 4 |
| Chem 435 | Nuclear and Radiochemistry Lab | 3 |
| Chem 445 | Instrumental Methods: Physical Chemistry | 3 |
| Chem 462 | Synthetic Polymer Chemistry Laboratory | 3 |
| Chem 470 | Inorganic Chemistry Laboratory | 3 |
| Biol 4522 | Laboratory in Protein Analysis, Proteomics | 3 |
|  | and Protein Structure | 4 |
| Biol 4523 | Molecular Methods in Enzyme Analysis | 4 |

All chemistry course work must be taken in residence at Washington University to be applied toward the chemistry major. A minimum grade of C- must be earned in each course to count toward the chemistry major.

Note: Per the College of Arts \& Sciences guidelines, for students who also pursue a minor or more than one major or minor program, only introductory (100- and 200-level) courses may be counted, when relevant, toward the requirements of both programs. All advanced (300-and 400-level) courses must be unique to each program. In other words, no advanced course may be "double-counted" for the course work needed to fulfill either program's minimal requirements. Should a student's major and minor programs require the same course, a departmentally sanctioned elective must be chosen to replace the course in one of the programs.

## Additional Information

## Latin Honors for the Major in Chemistry:

## Total units required: 56

To qualify for Latin Honors, students must complete a minimum of 21 units in advanced courses in chemistry or biochemistry, among which the following must be included:

| Code | Title | Units |
| :--- | :--- | ---: |
| Chem 401 | Physical Chemistry I | 3 |
| Chem 402 | Physical Chemistry II | 3 |
| Chem 461 | Inorganic Chemistry | 3 |

The student must also take two additional advanced courses in chemistry.

Students must also complete two additional laboratories. Students must choose one synthetic laboratory:

| Code | Title | Units |
| :--- | :--- | ---: |
| Chem 358 | Organic Chemistry Laboratory II | 4 |
| Chem 462 | Synthetic Polymer Chemistry Laboratory | 3 |
| Chem 470 | Inorganic Chemistry Laboratory | 3 |

and one physical laboratory:

| Code | Title | Units |
| :--- | :--- | ---: |
| Chem 435 | Nuclear and Radiochemistry Lab | 3 |
| Chem 445 | Instrumental Methods: Physical Chemistry | 3 |

Neither Chem 490 Introduction to Research nor Chem 495 Advanced Undergraduate Research in Chemistry can be used to satisfy the advanced laboratory requirements, but Chem 495 Advanced Undergraduate Research in Chemistry can be used to satisfy an elective.

Latin Honors for the Major in Chemistry With a Concentration in Biochemistry:

Total units required: 62
To qualify for Latin Honors, students must complete a minimum of 21 units in advanced courses, including one of the following six courses:

| Code | Title | Units |
| :--- | :--- | ---: |
| Biol 334 | Cell Biology | 3 |
| Biol 349 | Microbiology | 4 |
| Chem 453 | Bioorganic Chemistry | 3 |
| Chem 464 | Inorganic Biochemistry | 3 |
| Chem 483 | Protein Biochemistry | 3 |
| Chem 485 | Nucleic Acids | 3 |

or a second laboratory course in advanced chemistry or biology chosen from the following list:

| Code | Title | Units |
| :--- | :--- | ---: |
| Chem 358 | Organic Chemistry Laboratory II | 4 |
| Chem 435 | Nuclear and Radiochemistry Lab | 3 |
| Chem 445 | Instrumental Methods: Physical Chemistry | 3 |
| Chem 462 | Synthetic Polymer Chemistry Laboratory | 3 |
| Chem 470 | Inorganic Chemistry Laboratory | 3 |
| Biol 4522 | Laboratory in Protein Analysis, Proteomics | 3 |
| Biol 4523 | and Protein Structure |  |

Departmental Honors for the Majors in Chemistry and Chemistry With a Concentration in Biochemistry: To graduate "with distinction," a student must maintain a Chemistry grade point average of 3.5 and complete at least one semester of Chem 490 research. To graduate "with high distinction," a student must maintain a Chemistry GPA of 3.65 and complete at least two semesters of chemistry research, one of which must be Chem 495. To graduate "with highest distinction," a student must maintain a Chemistry GPA of 3.8 and complete at least two semesters of chemistry research, one of which must be Chem 495. Chemistry research is defined as a research project performed under the direction of a Chemistry faculty member or a research project approved by the Chemistry Department Undergraduate Work Committee. A Chemistry GPA is calculated from the grades received in chemistry courses and chemistry prerequisites. The level of Departmental Honors that a student achieves will appear on the student's final transcript.

