

CHEMISTRY PROGRAMS AT THE UNIVERSITY OF VIRGINIA

An understanding of chemical principles is important in many fields of endeavor. Several chemistry programs are available depending on your educational and career goals; all offer a solid background in chemistry with an opportunity to tailor your program to individual needs. Detailed descriptions of the various chemistry major programs follow.

The *Bachelor of Arts in Chemistry* (B.A.) is a flexible program designed to prepare the student for further study in a wide range of fields. With a minimum number of required courses, the chemistry B.A. permits the student to design an undergraduate program uniquely suited to individual needs.

The *Bachelor of Science in Chemistry* (B.Sc.) is a pre-professional degree designed for students who plan to become chemists, either by going to graduate school or by working in the chemical industry. The B.Sc. program, approved by the American Chemical Society, emphasizes intensive study in the sciences.

The *B.Sc. in Chemistry with Specialization in Biochemistry* caters to students having a strong interest in biology and biological chemistry by incorporating biologically-related lecture and laboratory courses. Many students in this program plan to attend medical or dental school, but a significant fraction pursue graduate study in chemistry, biochemistry, environmental science, or related areas. For the student who wants chemistry with a strong physics orientation, a *B.Sc. in Chemistry with Specialization in Chemical Physics* is offered. For students with interest in materials sciences, we offer a *B.Sc. in Chemistry with Specialization in Materials Science*. For students with environmental interests, we offer a *B.Sc. in Chemistry with Specialization in Environmental Chemistry*. The *B.Sc. in Chemistry with Specialization in Chemical Education* is for students who intend to teach chemistry/science K-12; it is taken in conjunction with the Curry School's five-year Master of Teaching program, to which the student must seek admission. For more information on the Curry School program contact Professor Frackson Mumba at fm4v@virginia.edu.

All chemistry degrees require completion of a two year sequence of courses at the 1000 and 2000 levels. The two sequences are (1) 1410, 1420, 2410, and 2420 and the associated laboratories 1411, 1421, 2411, and 2421; or 1810, 1820, 2810, 2820 and the associated laboratories 1811, 1821, and 2811. The "400s" series courses present one year of introductory chemistry followed by one year of organic chemistry. The "800s" series presents chemical structure, reactivity, kinetics, and thermodynamics as an integrated sequence including organic. Either course sequence provides the foundation for the third and fourth year courses. The "800s" series is recommended for students with a particularly strong background in chemistry, usually with advanced placement in chemistry. Students can most easily change between the "400s" and "800s" series before the start of the second semester. The following pairs of courses overlap substantially and cannot both be taken for credit: 1410 and 1810; 1420 and 2820; 1820 and 2410; 2420 and 2810. All degrees must also meet the College Area Requirements.

Undergraduate Research: The Department has a very active undergraduate research program. Students who wish to see how science really works should seriously consider research. Students may do research over multiple semesters. Students who have identified a research group willing to sponsor them, should sign up for CHEM 3951 or 3961. The undergraduate webpage has an extensive section on research. <http://chem.virginia.edu/undergraduate-studies/undergraduate-research/>

The Chemistry Department undergraduate advisers (listed below) welcome your program questions. You are encouraged to consult with them early and regularly.

The Chemistry Department major advisers, e-mail addresses, and office and phone numbers, are:

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|------------------|--|-----------|----------|
| Kateri DuBay | khd2t@virginia.edu | Room 386A | 243-2159 |
| Andreas Gahlmann | ag5vu@virginia.edu | Room 129 | 924-3624 |
| Mike Hilinski | mh6cu@virginia.edu | Room 288C | 924-0159 |
| Brooks Pate | bp2k@virginia.edu | Room 207B | 243-0384 |
| Lin Pu | lp6n@virginia.edu | Room 250 | 924-6953 |

Cindy Knight, coordinator for the Undergraduate Program [Room 404, (434) 924-7995, csk3a@virginia.edu], is an invaluable resource. Check out our web home page, which has a wealth of information on our majors: <http://chem.virginia.edu/undergraduate-studies/>

Email: We strongly recommend that ALL students interested in chemistry subscribe to our email list. You may subscribe by mailing to csk3a@virginia.edu and requesting to be subscribed. Emails include scholarship information, job opportunities, course offerings, seminar announcements, deadlines, and advising information.

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Bachelor of Arts in Chemistry

The Bachelor of Arts in Chemistry (B.A.) is a flexible program designed to prepare the student for further study in a wide range of fields. With a minimum number of required courses, the Chemistry B. A. permits the student to design an undergraduate program uniquely suited to individual needs. This table shows the suggested sequence of required courses. Candidates not following the normal course sequence should consult an advisor as early as possible. General area requirements or electives are chosen by the candidate in conference with an advisor; they must include courses that meet other College requirements (Foreign Language, Academic Writing, Humanities, etc.).

First Year - Credits: 30-37

- General area requirements or electives - Credits: 14-17
- CHEM 1410, 1411, 1420, 1421 - Introductory Chemistry I and II and Laboratories - Credits: 8
or
CHEM 1810, 1811, 1820, 1821 – Principles of Chemical Structure and Lab and Principles of Organic Chemistry and Laboratories - Credits: 12
- MATH 1210, 1220 – Applied Calculus I and II – Credits: 6
(MATH 1190 may be taken in place of MATH 1210)
or
MATH 1310, 1320 – Calculus I and II - Credits: 8

Second Year - Credits: 31-34

- General area requirements or electives - Credits: 9-12
- CHEM 2410, 2411, 2420, 2421 - Organic Chemistry I and II and Laboratories - Credits: 12
or
CHEM 2810, 2811, 2820 – Principles of Organic and Bioorganic Chemistry and Lab and Principles of Thermodynamics and Kinetics - Credits: 9
- PHYS 1425, 2415, 1429, 2419 – General Physics I and II and Laboratories - Credits: 8
(PHYS 2030, 2040 or 2630, 2640 may be taken as the laboratory)
or
PHYS 2010, 2020, 2030, 2040 – Principles of Physics I and II and Laboratories - Credits: 8

Third Year - Credits: 30-36

- General area requirements or electives - Credits: 15-18
- CHEM 3410, 3420 - Physical Chemistry-Quantum Theory and Physical Chemistry-Thermodynamics - Credits: 6
- CHEM 3811, 3821 – Physical Chemistry I and II Laboratories - Credits: 6

In addition, CHEM 3721 – Analytical Chemistry Laboratory is *highly recommended* prior to enrollment in advanced laboratories. It is best taken in the spring semester of the third year.

Fourth Year - Credits: 24-30

The fourth-year program is adaptable to individual student interests. Students may choose elective courses from any 4000 or greater level course in physical, organic, inorganic, analytical, or biological chemistry.

- General area requirements or electives - Credits: 21-27
- CHEM ELECTIVE – Credits: 3
The chemistry elective course required to complete the B.A. in chemistry may be any three-credit-hour chemistry course numbered at the 4000 level or higher, excluding laboratory research courses. It need not be specified at the time of declaring the major. [*e.g.*, Analytical Chem (CHEM 4090), Advanced Organic Chem (CHEM 5110), Inorganic Chem (CHEM 4320), Biological Chem (CHEM 4410), Advanced Physical Chem (CHEM 5210 or 5220)]. (Students cannot double count courses that are electives.)

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ACS Approved B.S. in Chemistry

The Bachelor of Science in Chemistry (B.Sc.) is a pre-professional degree designed for students who plan to become chemists, either by going to graduate school or by working in the chemical industry. The B.Sc. program, approved by the American Chemical Society, emphasizes intensive study in the sciences.

This table shows the suggested sequence of required courses. Candidates not following the normal course sequence should consult an advisor as early as possible. General area requirements or electives are chosen by the candidate in conference with an advisor; they must include courses that meet other College requirements (Foreign Language, Humanities, etc.).

First Year - Credits: 32-37

- General area requirements or electives - Credits: 14-17
- CHEM 1410, 1411, 1420, 1421 - Introductory Chemistry I and II and Laboratories - Credits: 8
or
CHEM 1810, 1811, 1820, 1821 - Principles of Chemical Structure and Lab and Principles of Organic Chemistry and Lab - Credits: 12
- MATH 1310, 1320 - Calculus I and II - Credits: 8

Second Year - Credits: 30-35

- General area requirements or electives - Credits: 8-14
- CHEM 2410, 2411, 2420, 2421 - Organic Chemistry I and II and Laboratories - Credits: 12
or
CHEM 2810, 2811, 2820 - Principles of Organic and Bioorganic Chemistry and Lab and Principles of Thermodynamics and Kinetics - Credits: 9
- MATH 2310 - Calculus III - Credits: 4
or
MATH 3250 - Ordinary Differential Equations - Credits: 4
or
APMA 2130 - Ordinary Differential Equations - Credits: 4
- PHYS 1425, 2415, 1429, 2419 - General Physics I and II and Laboratories - Credits: 8
(PHYS 2030, 2040 or 2630, 2640 may be taken as the laboratory)
or
PHYS 2010, 2020, 2030, 2040 - Principles of Physics I and II and Laboratories - Credits: 8

Third Year - Credits: 29-33

- General area requirements or electives - Credits: 12-18
- CHEM 3721 - Analytical Chemistry Laboratory - Credits: 4
or
CHEM 3951, 3961, 4951, or 4961 - Undergraduate Research - Credits: 3
(Please note that research used in place of CHEM 3721 cannot be used to satisfy the ACS Certification research requirement)
- CHEM 3410, 3420 - Physical Chemistry-Quantum Theory and Physical Chemistry-Thermodynamics - Credits: 6
- CHEM 3811, 3821 - Physical Chemistry I and II Laboratories - Credits: 6

Fourth Year - Credits: 30-36

- General area requirements or electives - Credits: 21
- CHEM 3951, 3961, 4951, and/or 4961 - Undergraduate Research - Credits: 6
(Please note that research used in place of CHEM 3721 cannot be used to satisfy this research requirement.)
- CHEM 4320 - Inorganic Chemistry - Credits: 3
- CHEM 4410 - Biological Chemistry I - Credits: 3
- CHEM 4090 - Analytical Chemistry - Credits: 3

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B. Sc. with Specialization in Biochemistry

The B.Sc. in Chemistry with Specialization in Biochemistry is a professional degree that can be approved by the American Chemical Society (if specific requirements are satisfied) and caters to students having a strong interest in biology and biological chemistry by incorporating biologically-related lecture and laboratory courses. Many students in this program plan to attend medical or dental school, but a significant fraction pursue graduate study in chemistry, biochemistry, environmental science, or related areas.

The BS Chemistry major with specialization in Biochemistry has been accredited by the American Society for Biochemistry and Molecular Biology (ASBMB). Beginning in Spring 2017, graduating students can take the ASBMB certification exam to earn an ASBMB certified degree. The evaluators recognized several strengths of our program:

- Excellent opportunities for independent research
- Emphasis on teamwork and communication skills
- Inquiry components integrated into multiple courses
- Strong experiential learning throughout the curriculum

This table shows the suggested sequence of required courses. Candidates not following the normal course sequence should consult an advisor as early as possible. General area requirements or electives are chosen by the candidate in conference with an advisor; they must include courses that meet other College requirements (Foreign Language, Academic Writing, Humanities, etc.).

First Year - Credits: 30-37

- General area requirements or electives - Credits: 14-17
- CHEM 1410, 1411, 1420, 1421 - Introductory Chemistry I and II and Laboratories - Credits: 8
or
CHEM 1810, 1811, 1820, 1821 – Principles of Chemical Structure and Lab and Principles of Organic Chemistry and Lab - Credits: 12
- MATH 1210, 1220 - Applied Calculus I and II - Credits: 6
(MATH 1190 may be taken in place of MATH 1210)
or
MATH 1310, 1320 - Calculus I and II - Credits: 8

Second Year - Credits: 34-42

- General area requirements or electives - Credits: 8-14
- BIOL 2100, 2200 - Introduction to Biology w/ Laboratory: Cell Biology & Genetics and Introduction to Biology w/ Laboratory: Organismal & Evolutionary Biology - Credits: 8
- CHEM 2410, 2411, 2420, 2421 - Organic Chemistry I and II and Laboratories - Credits: 12
or
CHEM 2810, 2811, 2820 - Principles of Organic and Bioorganic Chemistry and Lab and Principles of Thermodynamics and Kinetics - Credits: 9
- PHYS 1425, 2415, 1429, 2419 – General Physics I and II and Laboratories - Credits: 8
(PHYS 2030, 2040 or 2630, 2640 may be taken as the laboratory)
or
PHYS 2010, 2020, 2030, 2040 – Principles of Physics I and II and Laboratories - Credits: 8

Third Year - Credits: 30-39

- General area requirements or electives - Credits: 12-18
- BIOL 3000 - Cell Biology and Biochemistry - Credits: 3
or
BIOL 3010 – Genetic and Molecular Biology – Credits: 4
- CHEM 3721 – Analytical Chemistry Laboratory - Credits: 4
or
CHEM 3951, 3961, 4951, or 4961 – Undergraduate Research - Credits: 3
(Please note that research used in place of CHEM 3721 cannot be used to satisfy the ACS Certification research requirement)
- CHEM 3410, 3420 - Physical Chemistry-Quantum Theory and Physical Chemistry-Thermodynamics - Credits: 6
- CHEM 4410, 4420 - Biological Chemistry I and II - Credits: 6

Fourth Year - Credits: 33

- General area requirements or electives - Credits: 12-18
- CHEM 3951, 3961, 4951, and/or 4961 - Undergraduate Research - Credits: 6*
(Please note that research used in place of CHEM 3721 cannot be used to satisfy this research requirement.)
- CHEM 4320 - Inorganic Chemistry - Credits: 3
- CHEM 4411, 4421 - Biological Chemistry I and II Laboratories - Credits: 8

* Required for ACS certified degree only

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Spring 2017

B. Sc. with Specialization in Chemical Physics

The B.Sc. in Chemistry with Specialization in Environmental Chemistry is a professional degree that can be approved by the American Chemical Society (if specific requirements are satisfied) and is designed to prepare the student for a career in chemistry.

This table shows the suggested sequence of required courses. Candidates not following the normal sequence should consult an advisor as early as possible. General area requirements or electives are chosen by the candidate in conference with an advisor; they must include courses that meet other College requirements (Foreign Language, Academic Writing, Humanities, etc.).

First Year - Credits: 32-37

- General area requirements or electives - Credits: 14-17
- CHEM 1410, 1411, 1420, 1421 - Introductory Chemistry I and II and Laboratories - Credits: 8
or
CHEM 1810, 1811, 1820, 1821 – Principles of Chemical Structure and Lab and Principles of Organic Chemistry and Lab - Credits: 12
- MATH 1310, 1320 - Calculus I and II - Credits: 8
- PHYS 1710, 1720 – Introductory Physics I and II – Credits: 8

Second Year - Credits: 30-35

- General area requirements or electives - Credits: 8-14
- CHEM 2410, 2411, 2420, 2421 - Organic Chemistry I and II and Laboratories - Credits: 12
or
CHEM 2810, 2811, 2820 - Principles of Organic and Bioorganic Chemistry and Lab and Principles of Thermodynamics and Kinetics - Credits: 9
- MATH 2310 – Calculus III – Credits: 4
or
MATH 3250 – Ordinary Differential Equations – Credits: 4
or
APMA 2130 – Ordinary Differential Equations – Credits: 4
- PHYS 2610, 2620 – Introductory Physics III and Modern Physics – Credits: 8
- PHYS 2630, 2640 Elementary Laboratory I and II – Credits: 6
or
PHYS 2030, 2040 – Basics Physics Laboratories I and II - Credits: 2

Third Year - Credits: 29-33

- General area requirements or electives - Credits: 12-18
- CHEM 3721 – Analytical Chemistry Laboratory - Credits: 4
or
CHEM 3951, 3961, 4951, or 4961 – Undergraduate Research - Credits: 3
(Please note that research used in place of CHEM 3721 cannot be used to satisfy the ACS Certification research requirement)
- CHEM 3410, 3420 - Physical Chemistry-Quantum Theory and Physical Chemistry-Thermodynamics - Credits: 6
- CHEM 3811, 3821 – Physical Chemistry I and II Laboratories - Credits: 6
- PHYS ____ Two approved PHYS electives – Credits: 6
(Students cannot double count courses that are electives)

Fourth Year - Credits: 30-48

- General area requirements or electives - Credits: 24-30
- CHEM 3951, 3961, 4951, and/or 4961 – Undergraduate Research - Credits: 6*
(Please note that research used in place of CHEM 3721 cannot be used to satisfy this research requirement.)
- CHEM 4320 - Inorganic Chemistry - Credits: 3*
- CHEM 4410 – Biological Chemistry I - Credits: 3*
- Two of the following:
CHEM 5210 – Advanced Physical Chemistry I: Quantum Mechanics – Credits: 3
CHEM 5220 – Advanced Physical Chemistry II: Statistical Mechanics – Credits: 3
CHEM 5224 – Reaction Kinetics and Dynamics – Credits: 3
CHEM 5250 – Molecular Spectroscopy – Credits: 3
(Students cannot double count courses that are electives)

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Spring 2017

B. Sc. with Specialization in Environmental Chemistry

The B.Sc. in Chemistry with Specialization in Environmental Chemistry is a professional degree that can be approved by the American Chemical Society (if specific requirements are satisfied) and is designed to prepare the student for a career in chemistry.

This table shows the suggested sequence of required courses. Candidates not following the normal sequence should consult an advisor as early as possible. General area requirements or electives are chosen by the candidate in conference with an advisor; they must include courses that meet other College requirements (Foreign Language, Academic Writing, Humanities, etc.).

First Year - Credits: 27-34

- General area requirements or electives - Credits: 11-14
- CHEM 1410, 1411, 1420, 1421 - Introductory Chemistry I and II and Laboratories - Credits: 8
or
CHEM 1810, 1811, 1820, 1821 – Principles of Chemical Structure and Lab and Principles of Organic Chemistry and Lab - Credits: 12
- MATH 1210, 1220 - Applied Calculus I and II - Credits: 6
(MATH 1190 may be taken in place of MATH 1210)
or
MATH 1310, 1320 - Calculus I and II Credits: 8

Second Year - Credits: 32-39

- General area requirements or electives - Credits: 6-9
- CHEM 2410, 2411, 2420, 2421 - Organic Chemistry I and II and Laboratories - Credits: 10
or
CHEM 2810, 2811, 2820 - Principles of Organic and Bioorganic Chemistry and Lab and Principles of Thermodynamics and Kinetics - Credits: 9
- Two of the following courses and laboratories:
EVSC 2800/2801 - Fundamentals of Geology and Laboratory - Credits: 4
EVSC 3200/3201 - Fundamentals of Ecology and Laboratory - Credits: 4
EVSC 3300/3301 - Atmosphere and Weather and Laboratory - Credits: 4
EVSC 3600/3601 - Physical Hydrology and Laboratory - Credits: 4
- PHYS 1425, 2415, 1429, 2419 – General Physics I and II and Laboratories – Credits: 8
(PHYS 2030, 2040 or 2630, 2640 may be taken as the lab)
or
PHYS 2010, 2020, 2030, 2040 - Principles of Physics I and II and Laboratories - Credits: 8

Third Year Credits: 24-32

- General area requirements or electives - Credits: 12
- CHEM 3721 – Analytical Chemistry Laboratory - Credits: 4
or
CHEM 3951, 3961, 4951, or 4961 – Undergraduate Research - Credits: 3
(Please note that research used in place of CHEM 3721 cannot be used to satisfy the ACS Certification research requirement)
- CHEM 3410, 3420 - Physical Chemistry-Quantum Theory and Physical Chemistry-Thermodynamics - Credits: 6
- CHEM 3811 – Physical Chemistry I Laboratory - Credits: 3*
- CHEM 4090 – Analytical Chemistry - Credits: 3

Fourth Year - Credits: 30-39

- General area requirements or electives - Credits: 21
- CHEM 3951, 3961, 4951, and/or 4961 – Undergraduate Research - Credits: 6*
(Please note that research used in place of CHEM 3721 cannot be used to satisfy this research requirement.)
- CHEM 4320 - Inorganic Chemistry - Credits: 3
- CHEM 4410 – Biological Chemistry I - Credits: 3*
- Two Approved upper-level CHEM or EVSC electives - Credits: 6
Two additional courses at 4000-level or above CHEM, or approved upper-level EVSC courses (3000 to 5000 level). Examples include EVSC 3860, 4270, 4933, or additional EVSC core courses. (Students cannot double count courses that are electives.)

*Required for ACS certified degree only

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B. Sc. with Specialization in Materials Science

The B.Sc. in Chemistry with Specialization in Materials Science is a professional degree that can be approved by the American Chemical Society (if specific requirements are satisfied) and is designed to prepare the student for a career in chemistry. This table shows the suggested sequence of required courses. Candidates not following the normal sequence should consult an advisor as early as possible. General area requirements or electives are chosen by the candidate in conference with an advisor; they must include courses that meet other College requirements (Foreign Language, Academic Writing, Humanities, etc.).

First Year - Credits: 32-37

- General area requirements or electives - Credits: 11-14
- CHEM 1410, 1411, 1420, 1421- Introductory Chemistry I and II and Laboratories - Credits: 8
or
CHEM 1810, 1811, 1820, 1821 – Principles of Chemical Structure and Lab and Principles of Organic Chemistry and Lab - Credits: 12
- MATH 1310, 1320 - Calculus I and II - Credits: 8
- MSE 2090 - Intro to Materials Science - Credits: 3

Second Year - Credits: 32-48

- General area requirements or electives - Credits: 6-12
- CHEM 2410, 2411, 2420, 2421 - Organic Chemistry I and II and Laboratories - Credits: 12
or
CHEM 2810, 2811, 2820 - Principles of Organic and Bioorganic Chemistry and Lab and Principles of Thermodynamics and Kinetics - Credits: 9
- MATH 2310 - Calculus III - Credits: 4
or
MATH 3250 - Ordinary Differential Equations - Credits: 4
or
APMA 2130 – Ordinary Differential Equations - Credits: 4
- PHYS 1425, 2415 – General Physics I and II - Credits: 6
- PHYS 1429, 2419 – General Physics Laboratory I and II – Credits: 2
or
PHYS 2030, 2040 – Basic Physics Laboratory I and II - Credits: 2
or
PHYS 2630, 2640 – Elementary Physics Laboratory I and II - Credits: 6

Third Year - Credits: 30-33

- General area requirements or electives - Credits: 12
- CHEM 3721 – Analytical Chemistry Laboratory - Credits: 4
or
CHEM 3951, 3961, 4951, or 4961 – Undergraduate Research - Credits: 3
(Please note that research used in place of CHEM 3721 cannot be used to satisfy the ACS Certification research requirement)
- CHEM 3410, 3420 - Physical Chemistry-Quantum Theory and Physical Chemistry-Thermodynamics - Credits: 6
- CHEM 3811 – Physical Chemistry I Laboratory - Credits: 3
- CHEM 4090 – Analytical Chemistry - Credits: 3
- MSE 3050 - Phase Diagrams and Kinetics of Materials - Credits: 3

Fourth Year - Credits: 30-39

- General area requirements or electives - Credits: 18
- CHEM 3951, 3961, 4951, and/or 4961 – Undergraduate Research - Credits: 6*
(Please note that research used in place of CHEM 3721 cannot be used to satisfy this research requirement.)
- CHEM 4320 - Inorganic Chemistry - Credits: 3
- CHEM 4410 – Biological Chemistry I - Credits: 3*
- CHEM ELECTIVE (4000 level or higher) - Credits: 3
(Students cannot double count courses that are electives)
- MSE 3101 – Materials Science Investigations – Credits: 3
- MSE ELECTIVE (3000 Level or higher) – Credits: 3
(Students cannot double count courses that are electives)

In addition, ENGR 2500 – Introduction to Nanoscience and Technology is highly recommended.

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B. Sc. with Specialization in Chemical Education

The Specialization in Chemical Education is for students who intend to teach chemistry/science K-12; it is taken in conjunction with the Curry School's five-year Master of Teaching program, to which students must seek admission. This option is available only to students in the five-year Teachers Education Degree Program, and students must complete all requirements and comply with all regulations of the Curry School of Education as applicable to its Teachers Education Degree Program. For more information on the Curry School program and to carefully plan your course schedule in advance to make sure they fulfill all degree requirements (for both the Curry School and the College of Arts and Sciences, contact Professor Frackson Mumba at fm4v@virginia.edu).

This table shows the suggested sequence of required courses. Candidates not following the normal course sequence should consult an advisor as early as possible. General area requirements or electives are chosen by the candidate in conference with an advisor; they must include courses that meet other College requirements (Foreign Language, Academic Writing, Humanities, etc.).

First Year - Credits: 27-37

- General area requirements or electives - Credits: 11-14
- CHEM 1410, 1411, 1420, 1421 - Introductory Chemistry I and II and Laboratories - Credits: 8
or
CHEM 1810, 1811, 1820, 1821 - Principles of Chemical Structure and Lab and Principles of Organic Chemistry and Lab - Credits: 12
- MATH 1210, 1220 - Applied Calculus I and II - Credits: 6
(MATH 1190 may be taken in place of MATH 1210)
or
MATH 1310, 1320 - Calculus I and II - Credits: 8

Second Year - Credits: 30-33

- General area requirements or electives - Credits: 12-15
- CHEM 2410, 2411, 2420, 2421 - Organic Chemistry I and II and Laboratories - Credits: 12
or
CHEM 2810, 2811, 2820 - Principles of Organic and Bioorganic Chemistry and Lab and Principles of Thermodynamics and Kinetics - Credits: 9
- BIOL 2100 - Introduction to Biology w/Laboratory: Cell Biology and Genetics - Credits: 4
or
BIOL 2200 - Introduction to Biology w/Laboratory: Organismal and Evolutionary Biology - Credits: 4
- One of the following courses:
EVSC 2800 - Fundamentals of Geology - Credits: 3
EVSC 3200 - Fundamentals of Ecology - Credits: 3
EVSC 3300 - Atmosphere and Weather - Credits: 3
EVSC 3600 - Physical Hydrology - Credits: 3
(Students cannot double count courses that are electives)

Third Year - Credits: 25-30

- General area requirements or electives - Credits: 13
- CHEM 3721 - Analytical Chemistry Laboratory - Credits: 4
or
CHEM 3951, 3961, 4951, and/or 4961 - Undergraduate Research - Credits: 6*
(Please note that research used in place of CHEM 3721 cannot be used to satisfy the ACS research requirement below.)
- CHEM 4320 - Inorganic Chemistry - Credits: 3
- CHEM 4410 - Biological Chemistry I - Credits: 3
or
BIOL 3030 - Biochemistry - Credits: 3
- PHYS 1425, 2415, 1429, 2419 - General Physics I and II and Laboratories - Credits: 8
(PHYS 2030, 2040 or 2630, 2640 may be taken as the lab)
or
PHYS 2010, 2020, 2030, 2040 - Principles of Physics I and II and Laboratories - Credits: 8

Fourth Year - Credits: 30

- General area requirements or electives - Credits: 18
- CHEM 3410, 3420 - Physical Chemistry-Quantum Theory and Physical Chemistry-Thermodynamics - Credits: 6
- CHEM 3811 - Physical Chemistry I Laboratory - Credits: 3
or
CHEM 4411 - Biological Chemistry Laboratory I - Credits: 3
- CHEM 4090 - Analytical Chemistry - Credits: 3

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Bachelor of Arts/Masters of Arts in Chemistry ("Three Plus One" Degree Option)

Students seeking this degree option will complete their bachelor's degree in three years and then enter a one-year master's degree program. This option is not for all students. Students are encouraged to plan their course of studies early and meet with an undergraduate advisor in the Department of Chemistry to create a plan to graduate in three years. Electives must include courses that meet General Area Requirements (Foreign Language, Humanities, etc.). In order for students to complete both the B.A. and M.A. in four years, all undergraduate requirements must be completed by the end of the third year. In some cases students may begin taking master's level courses while completing their bachelor's degree.

Four Plus One Degree Option – Students that require four years to complete their bachelor's degree in chemistry (B.A. or B.Sc.) still have the option with an endorsement from their advisor to be automatically enrolled into the graduate school M.A. program in chemistry.

First Year - Credits: 30-37

- Approved electives - Credits: 14-17
- CHEM 1410, 1411, 1420, 1421 - Introductory Chemistry I and II and Laboratories - Credits: 8
or
CHEM 1810, 1811, 1820, 1821 – Principles of Chemical Structure and Lab and Principles of Organic Chemistry and Laboratories - Credits: 12
- MATH 1210, 1220 – Applied Calculus I and II – Credits: 6
or
MATH 1310, 1320 – Calculus I and II - Credits: 8

Second Year - Credits: 32-35

- Approved electives - Credits: 12-15
- CHEM 2410, 2411, 2420, 2421 - Organic Chemistry I and II and Laboratories - Credits: 12
or
CHEM 2810, 2811, 2820 – Principles of Organic and Bioorganic Chemistry and Lab and Principles of Thermodynamics and Kinetics - Credits: 9
- PHYS 1425, 2415, 1429, 2419 – General Physics I and II and Laboratories - Credits: 8
(PHYS 2030, 2040 or 2630, 2640 may be taken as the laboratory)
or
PHYS 2010, 2020, 2030, 2040 – Principles of Physics I and II and Laboratories - Credits: 8

Third Year - Credits: 30-36

- Approved electives - Credits: 15-18
- CHEM 3410, 3420 - Physical Chemistry-Quantum Theory and Physical Chemistry-Thermodynamics - Credits: 6
- CHEM 3811, 3821 – Physical Chemistry I and II Laboratories - Credits: 6
- CHEM ELECTIVE – Credits: 3
The chemistry elective course required to complete the B.A. in chemistry may be any three-credit-hour chemistry course numbered at the 4000 level or higher, excluding laboratory research courses. It need not be specified at the time of declaring the major. (Students cannot double count courses that are electives.)

In addition, CHEM 3721 – Analytical Chemistry Laboratory is *highly recommended* prior to enrollment in advanced laboratories. It is best taken in the spring semester of the third year.

Fourth Year - Credits: 30

- Any TEN of the following courses:

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|--|---|
| 5110 Organic Chemistry III: Structure, Reactivity, and Mechanism | 5410 Advanced Biological Chemistry I: Molecular Assembly and Information Flow |
| 5120 Organic Chemistry IV: Survey of Synthetic Methods-Selectivity, Scope, and Limitations | 5420 Advanced Biological Chemistry II: Macromolecular Structure and Function |
| 5180 Instrumental Theory and Techniques in Organic Chemistry | 5430 Nanoscale Imaging of Complex Systems in Chemistry and Biology |
| 5210 Advanced Physical Chemistry I: Quantum Mechanics | 5510 Selected Topics in Organic Chemistry (Drug Discovery) |
| 5220 Advanced Physical Chemistry II: Statistical Mechanics | 5570 Selected Topics - Analytical Chemistry (Luminescence) |
| 5224 Reaction Kinetics and Dynamics | 5720 Methods in Bioanalytical Chemistry |
| 5250 Molecular Spectroscopy | 5730 Advanced Analytical Chemistry |
| 5260 Introduction to Astrochemistry | 5731 Computer Interfacing and Applications to Chemistry |
| 5310 Advanced Inorganic Chemistry I: Reaction Mechanisms | 5740 Analytical Chemistry: Separations |
| 5320 Advanced Inorganic Chemistry II: Organometallics and Synthesis | 5750 Analytical Chemistry Spectroscopy |
| 5330 Structural Inorganic Chemistry: Characterization and Spectroscopy | 8999 Masters Research |
| 5340 Nanomaterials: Synthesis, Properties, and Applications | |
| 5380 Determination of Molecular Structure by Diffraction Methods | |

Spring 2017

