

CHEMISTRY MAJOR (B.S.)

Program Curriculum

Code	Title	Credits
Degree Core Requirements		
CHEM 1004	First Year Experience in Chemistry	1
CHEM 1055	General Chemistry for Chemistry Majors ^{1,2}	4
CHEM 1056	General Chemistry for Chemistry Majors ^{1,2}	4
CHEM 1065	General Chemistry for Chemistry Majors Lab ^{1,3}	1
CHEM 1066	General Chemistry for Chemistry Majors Lab ^{1,3}	1
CHEM 2565	Principles of Organic Chemistry ^{1,4}	3
CHEM 2566	Principles of Organic Chemistry ^{1,4}	3
CHEM 2154	Analytical Chemistry for Chemistry Majors ¹	4
CHEM 2164	Analytical Chemistry for Chemistry Majors Lab ¹	1
Subtotal		22
Additional Course Requirements		
CHEM 2555	Organic Synthesis and Techniques Lab ^{1,5}	2
CHEM 2556	Organic Synthesis and Techniques Lab ^{1,5}	2
CHEM 2564	Problem-Solving in Organic Chemistry	1
CHEM 3004	Bridge to the Future	1
CHEM 4014	Survey of Chemical Literature ¹	1
Subtotal		7
Major Requirements		
CHEM 2424	Descriptive Inorganic Chemistry ¹	3
CHEM 3615	Physical Chemistry ^{1,6}	3
CHEM 3616	Physical Chemistry ¹	3
CHEM 3625	Physical Chemistry Laboratory ¹	1
CHEM 3626	Physical Chemistry Laboratory ¹	1
CHEM 4114	Instrumental Analysis ¹	3
CHEM 4124	Instrumental Analysis Laboratory ¹	1
CHEM 4404	Physical Inorganic Chemistry ¹	3
CHEM 4414	Inorganic Chemistry Lab ¹	2
Select one of the following:		3
CHEM 4534	Organic Chemistry of Polymers ¹	
CHEM 4634	Polymer and Surface Chemistry ¹	
CHEM/SBIO 4424	Polysaccharide Chemistry ¹	
CHEM 4584	Bioorganic Chemistry ¹	3
MATH 2114	Introduction to Linear Algebra	3
MATH 2204	Introduction to Multivariable Calculus ¹	3
MATH 2214	Introduction to Differential Equations ¹	3
Subtotal		35
Restricted Electives		
Students may choose any 3-credit, 4000-level course in CHEM, BCHM, or CHE for which applicable prerequisites are met. ⁷		3
Subtotal		3
Free Electives		
Select remaining credit hours of free elective to fulfill 120 credit hour requirement		4
Subtotal		4
Pathways to General Education		
<i>Pathways Concept 1 - Discourse</i>		

Select six credits in Pathway 1f (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G01F) (foundational writing or speaking courses) and three credits in Pathway 1a (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G01A) (advanced or applied writing or speaking courses).	9
<i>Pathways Concept 2 - Critical Thinking in the Humanities</i>	
Select six credits of Pathway 2 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02)	6
<i>Pathways Concept 3 - Reasoning in the Social Sciences</i>	
Select six credits of Pathway 3 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03) ⁸	6
<i>Pathways Concept 4 - Reasoning in the Natural Sciences</i>	
PHYS 2305 Foundations of Physics & PHYS 2306 and Foundations of Physics ¹	8
<i>Pathways Concept 5 - Quantitative and Computational Thinking</i>	
MATH 1225 Calculus of a Single Variable & MATH 1226 and Calculus of a Single Variable (5F) ¹	8
STAT 3005 Statistical Methods (5A) ^{1,9} or STAT 3615 Biological Statistics	3
<i>Pathways Concept 6 - Critique and Practice in Design and the Arts</i>	
Select three credits in Pathway 6d (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06D)	3
Select three credits in Pathway 6a (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06A)	3
<i>Pathways Concept 7 - Critical Analysis of Identity and Equity in the United States</i>	
Select three credits of Pathway 7 (https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G07)	3
Subtotal	49
Total Credits	120

¹ Course has prerequisites. Consult the catalog.

² *General Chemistry Lecture Substitutions.* A student who earned credit for CHEM 1035 with a grade of "B" or better prior to joining the major in Chemistry may substitute CHEM 1035 for CHEM 1055. A student who earned credit for CHEM 1036 with a grade of "B" or better prior to joining the major in Chemistry may substitute CHEM 1036 for CHEM 1056.

³ *General Chemistry Lab Substitutions.* A student who earned credit for CHEM 1045 prior to joining the major in Chemistry may substitute CHEM 1045 for CHEM 1065. A student who earned credit for CHEM 1046 prior to joining the major in Chemistry may substitute CHEM 1046 for CHEM 1066.

⁴ *Organic Chemistry Lecture Substitutions.* A student who earned credit for CHEM 2535 with a grade of "B" or better prior to joining the major in Chemistry may substitute CHEM 2535 for CHEM 2565. A student who is substituting CHEM 2535 for CHEM 2565 may also substitute one additional credit of free elective for the one credit CHEM 2564, since CHEM 2564 is meant as a companion course to CHEM 2565. A student who earned credit for CHEM 2536 with a grade of "B" or better prior to joining the major in Chemistry may substitute CHEM 2536 for CHEM 2566.

⁵ *Organic Chemistry Lab Substitutions.* A student who earned credit for CHEM 2545 prior to joining the major in Chemistry may substitute CHEM 2545 for CHEM 2555. To compensate for differences in content (mostly with respect to training on specific instrumentation), the substitution requires the student to enroll in one credit of CHEM 4994

with a project that uses the same types of instrumentation (such as IR and NMR). A student who earned credit for CHEM 2546 prior to joining the major in Chemistry may substitute CHEM 2546 for CHEM 2556. To compensate for differences in content (mostly with respect to training on specific instrumentation), the substitution requires the student to enroll in one credit of CHEM 4994 with a project that uses the same types of instrumentation (such as IR and NMR).

⁶ Credit for CHE 2164 Chemical Engineering Thermodynamics may be substituted for CHEM 3615.

⁷ Three credits of CHEM 4994 Undergraduate Research may substitute for the Restricted Elective.

⁸ PSYC 1004 and SOC 1004 are recommended for students pursuing health-science professions.

⁹ STAT 4604 may be substituted for (STAT 3005 or STAT 3615).

¹ A course with prerequisites or co-requisites.

² Prior credit for CHEM 1045 General Chemistry Laboratory may be substituted for CHEM 1065 General Chemistry for Chemistry Majors Lab.

³ Prior credit for CHEM 1046 General Chemistry Laboratory may be substituted for CHEM 1066 General Chemistry for Chemistry Majors Lab.

⁴ If a student has taken CHEM 2535 Organic Chemistry prior to adding a degree in chemistry, a minimum grade of "B" (3.0) or better is required to substitute CHEM 2535 Organic Chemistry as CHEM 2565 Principles of Organic Chemistry. If a student has taken CHEM 2536 Organic Chemistry prior to adding a degree in chemistry, a minimum grade of "B" (3.0) or better is required to substitute CHEM 2536 Organic Chemistry as CHEM 2566 Principles of Organic Chemistry.

⁵ Since CHEM 2545 Organic Chemistry Laboratory-CHEM 2546 Organic Chemistry Laboratory does not satisfy the prerequisite for CHEM 2556 Organic Synthesis and Techniques Lab (due to training on specific instrumentation), if a student adds a CHEM BS degree after completing CHEM 2545 Organic Chemistry Laboratory-CHEM 2546 Organic Chemistry Laboratory, two or more credits of CHEM 4994 Undergraduate Research may substitute for CHEM 2556 Organic Synthesis and Techniques Lab to meet the requirement.

⁶ MATH 1225 Calculus of a Single Variable¹-MATH 1226 Calculus of a Single Variable¹ and PHYS 2305 Foundations of Physics-PHYS 2306 Foundations of Physics¹ are also required of all Chemistry Majors within the B.S. Degree Program in Chemistry. These courses are listed in the Pathways to General Education section.

⁷ STAT 4604 Statistical Methods for Engineers may be substituted for (STAT 3005 Statistical Methods or STAT 3615 Biological Statistics).

⁸ Credit for CHEM 2164 Analytical Chemistry for Chemistry Majors Lab may be substituted for CHEM 3615 Physical Chemistry

⁹ PSYC 1004 Introductory Psychology and SOC 1004 Introductory Sociology are recommended for students contemplating careers in health sciences.

¹⁰ Students majoring in Chemistry within the B.S. Degree in Chemistry must select either STAT 3005 Statistical Methods¹ or STAT 3615 Biological Statistics¹.

Prerequisites

This checklist has no hidden prerequisites, although some of the courses listed are prerequisites for other courses. Please see your advisor or consult the Undergraduate Course Catalog for more

information. Please note that Chemistry majors are expected to be "calculus-ready" upon the start of their curriculum.

Graduation Requirements

Upon having attempted 72 credits, student must have completed

Code	Title	Credits
CHEM 1055	General Chemistry for Chemistry Majors	4
CHEM 1056	General Chemistry for Chemistry Majors	4
CHEM 1065	General Chemistry for Chemistry Majors Lab	1
CHEM 1066	General Chemistry for Chemistry Majors Lab	1
CHEM 1004	First Year Experience in Chemistry	1
CHEM 2565	Principles of Organic Chemistry	3
CHEM 2566	Principles of Organic Chemistry	3
CHEM 2555	Organic Synthesis and Techniques Lab	2
CHEM 2556	Organic Synthesis and Techniques Lab	2
PHYS 2305	Foundations of Physics	4
PHYS 2306	Foundations of Physics	4
MATH 1225	Calculus of a Single Variable	4
MATH 1226	Calculus of a Single Variable	4

Chemistry majors must maintain an in-major GPA of 2.0. If a chemistry major fails to meet this requirement for one academic term the student will be placed on Policy 91 (Satisfactory Progress Towards Degree) probation. Failure to meet the standard for two consecutive semesters will result in a Policy 91 suspension.

Graduation Requirements

Graduation Requirements

Graduation requires completion of a minimum of 120 credit hours with a GPA of 2.0 or greater for all hours attempted. In addition, students must have an in-major GPA of 2.0 or greater counting all required chemistry courses and chemistry electives. The in-major CHEM GPA excludes CHEM 1015, CHEM 1016, CHEM 1025, CHEM 1026, CHEM 1014, and CHEM 1004). No more than 6 hours of CHEM 2974, CHEM 4974, and CHEM 4994 will be included in a student's in-major GPA.

Minimum Grade Requirements

- A Chemistry major who earned a grade lower than "C" in CHEM 1055 must either repeat this course and earn the minimum grade ("C" or better) **or** take CHEM 1035 and earn a "B" or better.
- A Chemistry major who earned a grade lower than "C" in CHEM 1056 must either repeat this course and earn the minimum grade ("C" or better) **or** take CHEM 1036 and earn a "B" or better.
- A Chemistry major who earned a grade lower than "C" in CHEM 2565 must either repeat this course and earn the minimum grade ("C" or better) **or** take CHEM 2535 and earn a "B" or better.

Acceptable Substitutions

All substitutions have been encoded as footnotes in the Program Requirements section.

Foreign Language Requirement

Students who did not successfully complete at least two years of a single foreign, classical, or sign language during high school must successfully complete six credit hours of a single foreign, classical, or sign language at the college level. Courses taken to meet this requirement do not count toward the hours required for graduates. Please consult the Undergraduate Catalog for details.