MAJOR IN CHEMISTRY, HEALTH SCIENCES CONCENTRATION

The health science concentration compliments a students' chemistry knowledge with content from biology, anatomy, physiology, and microbiology. This concentration is recommended for students who wish to pursue a career in the medical, veterinary, pharmacy, dentistry, and allied fields. The additional course work is designed to enable students to fulfill the prerequisite requirements for health sciences professional programs.

Chemistry majors in the health sciences concentration are encouraged to participate in undergraduate research. Ample opportunities exist for undergraduate students to become involved in ground-breaking research in the laboratories of individual faculty members. Students have access to state-of-the-art equipment in faculty laboratories and the Analytical Resources Core facility, including NMR, FTIR, UV/Vis, fluorescence, and mass spectrometers, vacuum lines, x-ray diffractometers and many more. Undergraduate research is strongly encouraged for any student considering a career in the sciences, and many students complete supervised research for academic credit. Development of laboratory and research skills result in transferable skills that a graduate can apply towards a career in the health sciences.

Learning Outcomes

- Identify the anatomical features of humans or domestic animals and define their physiological roles.
- Articulate the role chemistry plays in disease and its treatment.
- Apply interdisciplinary knowledge from chemistry and related fields (biology, microbiology, anatomy, physiology and psychology) to problems and questions in the health sciences.

Requirements Effective Fall 2022

Chemistry majors must achieve a minimum grade of C (2.000) in all the listed courses required for the major in chemistry.

Freshman

		AUCC	Credits
CHEM 120[1]	Foundations of Modern Chemistry (GT-SC2)	3A	4
CHEM 121[1]	Foundations of Modern Chemistry Laboratory (GT-SC1)	3A	1
CHEM 192	Introductory Seminar in Chemistry		2
CHEM 241[2]	Foundations of Organic Chemistry		4
CHEM 242[2]	Foundations of Organic Chemistry Laboratory		1
CHEM 263	Foundations of Inorganic Chemistry		4
CHEM 264	Foundations of Inorganic Chemistry Laboratory		1
CO 150	College Composition (GT-CO2)	1A	3
LIFE 102	Attributes of Living Systems (GT-SC1)	3A	4
Select one course from the following:			4
MATH 155	Calculus for Biological Scientists I (GT-MA1)	1B	
MATH 160	Calculus for Physical Scientists I (GT-MA1)	1B	
Diversity, Equity, and Inclusion (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-equity-inclusion)		1C	3
	Total Credits		**31**

Sophomore

CHEM 231	Foundations of Analytical Chemistry		3
CHEM 232	Foundations of Analytical Chemistry Lab		2
CHEM 322	Foundations of Chemical Biology Laboratory		1
Select one course from the following:			4
BC 351	Principles of Biochemistry		
CHEM 321	Foundations of Chemical Biology		
Select one course from the following:			3-4
LIFE 103	Biology of Organisms-Animals and Plants (GT-SC1)	3A	
LIFE 201B	Introductory Genetics: Molecular/Immunological/Developmental (GT-SC2)	3A	
Select one course from the following:			5
PH 121	General Physics I (GT-SC1)	3A	
PH 141	Physics for Scientists and Engineers I (GT-SC1)	3A	
Select one course from the following:			5
PH 122	General Physics II (GT-SC1)	3A	

PH 142	Physics for Scientists and Engineers II (GT-SC1)	3A	
Select one group from the following:			8
Group A			
MATH 271	Applied Mathematics for Chemists I		
MATH 272	Applied Mathematics for Chemists II		
Group B			
MATH 161	Calculus for Physical Scientists II (GT-MA1)	1B	
MATH 261	Calculus for Physical Scientists III		
	Total Credits		**31-32**
Junior			
CHEM 320	Chemistry of Addictions		3
CHEM 371	Fundamentals of Physical Chemistry		4
CHEM 372	Fundamentals of Physical Chemistry Lab	4A	1
CHEM 440	Advanced Organic Chemistry Laboratory	4B	2
CHEM 445	Synthetic Organic Chemistry	4B	3
Select one course from the following:			3-4
BZ 350	Molecular and General Genetics		
LIFE 201B	Introductory Genetics: Molecular/Immunological/Developmental (GT-SC2)	3A	
Select one course from the following:			3
ECON 202	Principles of Microeconomics (GT-SS1)	3C	
PSY 100	General Psychology (GT-SS3)	3C	
Advanced Writing (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#advanced-writing)[3]		2	3
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-and-humanities)		3B	3
Historical Perspectives (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)		3D	3
	Total Credits		**28-29**
Senior			
BMS 300	Principles of Human Physiology		4
MIP 300	General Microbiology		3
SPCM 200	Public Speaking		3
Select one course from the following:			4-5
BMS 301	Human Gross Anatomy		
BMS 305	Domestic Animal Gross Anatomy		
Select one course from the following:			3
CHEM 433	Clinical Chemistry		
CHEM 448	Medicinal Chemistry		
Select one course from the following:			2
BMS 302	Laboratory in Principles of Physiology		
MIP 302	General Microbiology Laboratory		
Select one course from the following:			2
CHEM 493	Senior Seminar	4C	
CHEM 499[4]	Senior Thesis	4C	
In-depth Chemistry Course (see list below)			3-4
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-and-humanities)		3B	3
	Total Credits		**28**
	Program Total Credits:		**120**

In-depth Chemistry Courses

Code	Title	AUCC	Credits
CHEM 311	Introduction to Nanoscale Science		3
CHEM 315	Foundations of Polymer Chemistry		3
CHEM 333	Forensic Chemistry		3
CHEM 338	Environmental Chemistry		3
CHEM 431	Instrumental Analysis	4B	4
CHEM 433	Clinical Chemistry		3
CHEM 448	Medicinal Chemistry		3
CHEM 461	Inorganic Chemistry	4B	3
CHEM 462	Inorganic Chemistry Laboratory		2
CHEM 476	Physical Chemistry II	4B	3
CHEM 477	Physical Chemistry Laboratory II		1
CHEM 498	Research		1-3

[1] Students who complete General Chemistry in Freshman year (CHEM 111 or CHEM 107, CHEM 112 or CHEM 108, CHEM 113, CHEM 114) do not have to take CHEM 120 and CHEM 121.

[2] Students may complete the organic chemistry requirement by taking CHEM 341, CHEM 343, and CHEM 344. Students who take CHEM 245/CHEM 246 may complete the organic chemistry requirement by taking CHEM 343/CHEM 344. For both sets of these students, CHEM 343/CHEM 344 together count as an in-depth chemistry course.

[3] CHEM 301 is recommended.

[4] CHEM 499 by department approval. Students fulfilling the AUCC 4C requirement with CHEM 499 must write a thesis and present it to the department.

Major Completion Map

Distinctive Requirements for Degree Program:

TO PREPARE FOR FIRST SEMESTER: The curriculum for the new American Chemical Society Certified Chemistry major assumes students enter college prepared to take calculus. Entering students who are not prepared to take calculus will need to fulfill pre-calculus requirements in the first semester. CHEM 111 and CHEM 120 require Algebra II as a prerequisite (this prerequisite is met by having Algebra II by test credit, transfer credit, or placement out of MATH 117 and MATH 118 on Math Placement Exam). Earned grades of C (2.000) or better are required in all listed courses for the major in chemistry. Students with credit for CHEM 111 CHEM 112,CHEM 113, CHEM 114 do not need to take CHEM 120,CHEM 121. Students with credit for CHEM 341, CHEM 343, CHEM 344 do not need to take CHEM 241, CHEM 242.

Freshman

Semester 1		Critical	Recommended	AUCC	Credits
CHEM 120	Foundations of Modern Chemistry (GT-SC2)	X		3A	4
CHEM 121	Foundations of Modern Chemistry Laboratory (GT-SC1)	X		3A	1
CHEM 192	Introductory Seminar in Chemistry	X			2
CO 150	College Composition (GT-CO2)	X		1A	3
LIFE 102	Attributes of Living Systems (GT-SC1)	X		3A	4
Diversity, Equity, and Inclusion (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-equity-inclusion)		X		1C	3
	Total Credits				**17**

Semester 2		Critical	Recommended	AUCC	Credits
CHEM 241	Foundations of Organic Chemistry	X			4
CHEM 242	Foundations of Organic Chemistry Laboratory	X			1
CHEM 263	Foundations of Inorganic Chemistry	X			4
CHEM 264	Foundations of Inorganic Chemistry Laboratory	X			1
MATH 155 or 160	Calculus for Biological Scientists I (GT-MA1) Calculus for Physical Scientists I (GT-MA1)	X		1B	4
	Total Credits				**14**

Sophomore

Semester 3		Critical	Recommended	AUCC	Credits
CHEM 231	Foundations of Analytical Chemistry	X			3
CHEM 232	Foundations of Analytical Chemistry Lab	X			2
Select one course from the following:		X			3-4

LIFE 103	Biology of Organisms-Animals and Plants (GT-SC1)			3A	
LIFE 201B	Introductory Genetics: Molecular/Immunological/ Developmental (GT-SC2)			3A	
PH 121 or 141	General Physics I (GT-SC1) Physics for Scientists and Engineers I (GT-SC1)		X	3A	5
Select one course from the following:			X		4
Group A:					
MATH 271	Applied Mathematics for Chemists I				
Group B:					
MATH 161	Calculus for Physical Scientists II (GT-MA1)			1B	
	Total Credits				**17-18**
Semester 4		**Critical**	**Recommended**	**AUCC**	**Credits**
CHEM 321 or BC 351	Foundations of Chemical Biology Principles of Biochemistry				4
CHEM 322	Foundations of Chemical Biology Laboratory				1
PH 122 or 142	General Physics II (GT-SC1) Physics for Scientists and Engineers II (GT-SC1)		X	3A	5
Select one course from the following:			X		4
Group A:					
MATH 272	Applied Mathematics for Chemists II				
Group B:					
MATH 261	Calculus for Physical Scientists III				
	Total Credits				**14**
Junior					
Semester 5		**Critical**	**Recommended**	**AUCC**	**Credits**
CHEM 371	Fundamentals of Physical Chemistry	X			4
CHEM 372	Fundamentals of Physical Chemistry Lab	X		4A	1
CHEM 440	Advanced Organic Chemistry Laboratory	X		4B	2
CHEM 445	Synthetic Organic Chemistry	X		4B	3
Advanced Writing (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#advanced-writing)				2	3
	Total Credits				**13**
Semester 6		**Critical**	**Recommended**	**AUCC**	**Credits**
CHEM 320	Chemistry of Addictions	X			3
PSY 100 or ECON 202	General Psychology (GT-SS3) Principles of Microeconomics (GT-SS1)	X		3C,3C	3
Select one course from the following:		X			3-4
BZ 350	Molecular and General Genetics				
LIFE 201B	Introductory Genetics: Molecular/Immunological/ Developmental (GT-SC2)			3A	
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-and-humanities)			X	3B	3
Historical Perspectives (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)			X	3D	3
	Total Credits				**15-16**
Senior					
Semester 7		**Critical**	**Recommended**	**AUCC**	**Credits**
BMS 300	Principles of Human Physiology				4
MIP 300	General Microbiology	X			3
MIP 302 or BMS 302	General Microbiology Laboratory Laboratory in Principles of Physiology	X			2
In-depth Chemistry Course (see list on Program Requirements tab)		X			3-4

Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-and-humanities)			X	3B	3
	Total Credits				**15**
Semester 8		**Critical**	**Recommended**	**AUCC**	**Credits**
CHEM 433 or 448	Clinical Chemistry Medicinal Chemistry	X			3
SPCM 200	Public Speaking	X			3
Select one course from the following:		X			4-5
BMS 305	Domestic Animal Gross Anatomy				
BMS 301	Human Gross Anatomy				
Select one course from the following:		X			2
CHEM 493	Senior Seminar			4C	
CHEM 499	Senior Thesis			4C	
The benchmark courses for the 8th semester are the remaining courses in the entire program of study.		X			
	Total Credits				**13**
	Program Total Credits:				**120**