

MAJOR: CELL AND MOLECULAR BIOLOGY, B.S.

DEPARTMENT OF BIOLOGY

Cell and molecular biology are two of the most rapidly growing areas of modern biology. This major prepares students for graduate school and careers in cell biology, genetics, developmental biology, physiology, immunology, biotechnology, molecular biology, and microbiology. The major is also appropriate for students considering professional schools of medicine, dentistry, pharmacy, and veterinary medicine.

TYPICAL PROGRAM OF STUDY			
FIRST YEAR			
FALL SEMESTER		SPRING SEMESTER	
CHEM 1151 General Chemistry I ¹	5 cr	BIOL 1011 General Biology I	5 cr
MATH 1290 Calculus for the Natural Sciences [^]		CHEM 1152 General Chemistry II ¹	5 cr
or MATH 1296 Calc I or MATH 1596 Honors Calc I	5 cr	STAT or MATH course ²	<u>3-5 cr</u>
WRIT 1120 College Writing	<u>3 cr</u>		Total: 13 cr
	Total: 13 cr		
SECOND YEAR			
BIOL 1012 General Biology II	5 cr	BIOL 2101 Cell Biology	3 cr
CHEM 2541 Organic Chemistry I	3 cr	CHEM 2542 Organic Chemistry II	3 cr
CHEM 2543 Organic Chemistry I laboratory	1 cr	CHEM 2544 Organic Chemistry II laboratory	1 cr
Liberal Education Course or Minor Field Course	<u>4-6 cr</u>	PHYS 1001 Introduction to Physics I ³	5 cr
	Total: 13-15 cr	Liberal Education Course or Minor Field Course	<u>3 cr</u>
			Total: 15 cr
THIRD YEAR			
BIOL 2201 Genetics	3 cr	CHEM 3322 Biochemistry ⁶	3 cr
BIOL Laboratory Course ⁴ (BIOL 2102 or 2202)	2 cr	CHEM 3324 Biochemistry lab ⁶	1 cr
BIOL 3703 Animal Physiology ⁵	3 cr	BIOL 4361 Developmental Biology ⁵	3 cr
or BIOL 4603 Plant Physiology ⁵	3 cr	or BIOL 4501 Microbiology ⁵	4 cr
PHYS 1002 Introduction to Physics II ³	5 cr	WRIT 3150 Advanced Writing: Science	3 cr
Liberal Education Course or Minor Field Course	<u>3 cr</u>	Liberal Education Course or Minor Field Course	<u>3-6 cr</u>
	Total: 16 cr		Total: 13-17 cr
FOURTH YEAR			
BIOL 3987 Seminar	1 cr	BIOL 4231 Molecular Biology	3 cr
BIOL 4802 Evolution	3 cr	BIOL 5232 Molecular Biology lab	2 cr
BIOL elective ^{7,8}	3-4 cr	Liberal Education Course or Minor Field Course	4-6 cr
BIOL elective ^{7,8}	2-4 cr	Liberal Education Course or Minor Field Course	<u>4-6 cr</u>
Liberal Education Course or Minor Field Course	<u>3-4 cr</u>	Biology Department Exit Interview	
	Total: 12-16 cr		Total: 13-16 cr

[^]This schedule presupposes placement into Calculus I - MATH 1290, 1296, or 1596 by ACT Math score or Math Placement Exam.

¹CHEM 1161/1162 Honors General Chemistry I and II may substitute for CHEM 1151/1152

²Take STAT 2411 or STAT 3611 or MATH 1297 Calculus II

³PHYS 1001/1002 may be replaced by PHYS 2011/2012 that requires the completion of MATH 1297 Calculus II.

⁴**Laboratory Course Requirement:** Take either Cell Biol. Lab or Genetics Lab, if both are taken one can be used as cell biology. elective.

⁵**Cell Core requirement:** Take one of the following courses: BIOL 3703, 4361, 4603, (4501 or 4503). If more than one of these courses are taken, the excess may be used for cell biology elective credit.

⁶(CHEM 4351 and 4352 and 4363) may be substituted for (CHEM 3322 and 3324).

⁷**Cell Biology Electives** Take 5-10 credits from the following: BIOL 2102, 2202, 3101, 3703, 4199, 4361, (4501 or 4503), 4511, 4603, 4807, 5235, 5603, 5772, 5801, 5802, 5868. BIOL 3390 and 5590 special topics may be accepted only by prior departmental approval.

⁸**Non-Cell Biology Electives:** Take 0-5 credits from the following: BIOL 2769, 2801, 2802, 3601, 3603, 3701, 3760, 3994, 3996, 4731, 4761, 4763, 4764, 4803, 4805, 4891, 5240, 5401, 5777, 5805, 5807, 5808, 5809, 5811, 5833, 5839, 5861, 5862, 5863, 5865, 5866, 5870, MDBC 5501, MATH 5233, MICB 5545, MICB 5555, PHSL 5601, PHSL 5602, A maximum of 2 credits of BIOL 3993 (or SSP 3002 SI in biology) may be taken for elective credit with department consent.

For more information contact:

Department of Biology ♦ James I. Swenson Science Building 207
726-6262 ♦ biol@d.umn.edu ♦ <http://www.d.umn.edu/biology>

CELL AND MOLECULAR BIOLOGY, B.S.

MAJOR REQUIREMENTS	CREDITS	PREREQUISITES	SEMESTER TO BE COMPLETED	GRADE
Biology Core Requirements				
BIOL 1011 General Biology I	5	1 yr of high school or 1 semester of college chemistry		
BIOL 1012 General Biology II	5	BIOL 1011		
BIOL 2101 Cell Biology	3	BIOL 1011, 1012; CHEM 2541		
BIOL 2201 Genetics	3	BIOL 1012		
BIOL 3987 Biology Seminar	1	BIOL 2101 and 2201		
BIOL 4231 Molecular Biology	3	BIOL 4231 (concurrent registration OK)		
BIOL 5232 Molecular Biology lab	2	90 credits		
BIOL 4802 Evolution	3	BIOL 1012, 2201		
Biology Department Exit Interview	0			
BIOL 2102 Cell Biology laboratory ¹	2	BIOL 2101, (concurrent registration OK)		
or BIOL 2202 Genetics laboratory ¹	2	BIOL 2201, (concurrent registration OK)		
BIOL 3703 Animal Physiology ²	3	BIOL 1011, 1012, one semester college chemistry		
or BIOL 4603 Plant Physiology ²	3	BIOL 2101		
or BIOL 4361 Developmental Biology ²	3	BIOL 2101, 2201		
or BIOL 4501 Microbiology ²	4	BIOL 2101		
Electives, 10 credits				
Cell Biology electives: take 5-10 credits from: BIOL 2102, 2202, 3101, 3703, 4199, 4361, (4501 or 4503), 4511, 4603, 4807, 5235, 5603, 5772, 5801, 5802, 5868. Courses cannot be used in for any other category, see footnotes 1, 2 and 3.				
BIOL xxxx ^{1,2,3}	1-4			
BIOL xxxx ^{1,2,3}	1-4			
BIOL xxxx ^{1,2,3}	1-4			
Non-Cell Biology electives: take 0-5 credits from: BIOL 2769, 2801, 2802, 3601, 3603, 3701, 3760, 3993, 3994, 3996, 4731, 4761, 4763, 4764, 4803, 4805, 4891, 5240, 5401, 5777, 5805, 5807, 5808, 5809, 5811, 5833, 5839, 5861, 5862, 5863, 5865, 5866, 5870, MDBC 5501, MATH 5233, MICB 5545, MICB 5555, PHSL 5601, PHSL 5602, see footnote 4.				
BIOL elective ⁴	1-4			
BIOL elective ⁴	1-4			
Chemistry Requirements				
CHEM 1151 General Chemistry I ⁵	5	MATH ACT \geq 21 or MATH 1005 with at least a C-, 1 yr HS chemistry		
CHEM 1152 General Chemistry II ⁵	5	CHEM 1151		
CHEM 2541 Organic Chemistry I	3	CHEM 1152 or 1162		
CHEM 2543 Organic Chemistry I laboratory	1	CHEM 2541 - concurrent registration OK		
CHEM 2542 Organic Chemistry II	3	CHEM 2541		
CHEM 2544 Organic Chemistry II laboratory	1	CHEM 2542 - concurrent registration OK		
CHEM 3322 Biochemistry ⁶	3	CHEM 2541 or 2542		
CHEM 3324 Biochemistry lab ⁶	1	Concurrent registration in CHEM 3322		
Mathematics Requirements				
MATH 1290 or 1296 Calculus I ^ or MATH 1596 Honors Calculus I ^	5	Math ACT \geq 25 or MATH 1250 with at least a C- MATH 1250 or 3 ½ years HS math incl. trig., dept. consent		
STAT 2411 Statistical Methods	4	MATH 1250 or 1160		
or STAT 3611 Intro. to Probability & Statistics	3	MATH 1290, 1296 or 1596		
or MATH 1297 Calculus II	5	MATH 1290, 1296 or 1596 with at least a C-		
or MATH 1597 Honors Calculus II	5	MATH 1596 or an 'A' in 1290 or 1296, dept. consent		
Physics Requirements				
PHYS 1001 Introduction to Physics I ⁷	5	Algebra and Trigonometry		
PHYS 1002 Introduction to Physics II ⁷	5	PHYS 1001		
Writing Requirements				
WRIT 1120 College Writing	3			
WRIT 3150 Advanced Writing: Science	3	WRIT 1120; 60 credits		

[^]This schedule presupposes placement into Calculus I - MATH 1290, 1296, or 1596 by ACT Math score or Math Placement Exam.

¹Take either Cell Biol. Lab or Genetics Lab, if both are taken one can be used as cell biology elective.

²If more than one of these courses: BIOL 3703, 4361, 4603, (4501 or 4503) are taken; the excess may be used for cell biology elective credit.

³BIOL 3390 and 5590 special topics may be accepted only by prior departmental approval.

⁴Two credits of SSP 3002 - Teaching Assistant Practicum for supplemental instruction in biology may be substituted for BIOL 3993 as non-cell biology elective credit with department approval.

⁵CHEM 1161/1162 Honors General Chemistry I and II may substitute for CHEM 1151/1152

⁶(CHEM 4351 and 4352 and 4363) may be substituted for (CHEM 3322 and 3324).

⁷PHYS 1001/1002 may be replaced by PHYS 2011/2012 that requires the completion of MATH 1297 Calculus II.

NOTE: In addition to the above requirements, students must complete the liberal education program and a minor (or a second major) to earn a B.S. degree. Biology may not be used to satisfy this requirement.