

MAJOR CHEMISTRY



CHEMISTRY
THE UNIVERSITY OF BRITISH COLUMBIA

FIRST YEAR		THIRD AND FOURTH YEARS	
COMMUNICATION REQUIREMENT ¹	3	BIOL 201 (OR BIOC 202) ⁸	3
CHEM 121 (111), 123	8	CHEM 300 ¹	3
MATH 100 OR 102 OR 104 ²	3	CHEM 304	3
MATH 101 OR 103 OR 105 ³	3	CHEM 311	3
PHYS 100-LEVEL 4	6	CHEM 312	3
ELECTIVES ^{5,6}	7	CHEM 325, 345	4
TOTAL CREDITS	30	TWO OF CHEM 305, 313, 318, 327, 330, 412	6
SECOND YEAR		CHEM 445 ⁹	3
CHEM 203 ⁷	4	CHEM ELECTIVES ^{6,9,10}	12
CHEM 208, 218	6	ELECTIVES ^{5,6}	20
CHEM 211	4	TOTAL CREDITS	60
CHEM 213, 245	4	TOTAL CREDITS FOR DEGREE	120
MATH 200, 221	6		
ELECTIVES ^{5,6}	6		
TOTAL CREDITS	30		

¹ Of the 6 credits of coursework is required to satisfy the Communication Requirement, 3 credits are specified in third year (CHEM 300). The remaining 3 credits must be chosen from the list of acceptable courses, see [Communication Requirement](#). ENGL credits beyond those needed to satisfy the Communication Requirement may be applied towards the Faculty of Science [Arts Requirement](#).

² MATH 180 or 184 or 120 may substitute for any of the specified differential calculus courses listed by decreasing the electives by 1 credit. MATH 110 may substitute for any of the specified differential calculus courses listed by decreasing the electives by 3 credits.

³ MATH 121 may substitute for any of the specified integral calculus courses listed by decreasing the electives by 1 credit.

⁴ Chosen from 100-level PHYS courses, excluding PHYS 100. PHYS 109 or 119 are recommended. Students without Physics 12 must take PHYS 100 before taking other 100-level PHYS courses.

⁵ Electives must be chosen to ensure the Faculty of Science: a) [Arts Requirement](#), b) [Upper-level Requirement](#), and c) [Breadth Requirement](#) are met. Elective credits may be redistributed among the years in this specialization, provided the total number remains the same. The year level of an elective does not need to correspond to the year level of the specialization. Students who do not have credit for Biology 11 or 12 must take 3 credits of 100-level BIOL (usually BIOL 111). Students with credit for Biology 11 or 12 must successfully complete 3 credits of an ASTR, BIOL, EOSC, or GEOB lecture course.

⁶ Students may elect to apply elective credits towards a [Specific Focus Area in Chemistry](#).

⁷ Students with CHEM 235 and a score of 76% or higher in CHEM 233 may apply for admission to this specialization and will be allowed to use CHEM 233 and 235 in place of CHEM 203.

⁸ BIOC 203 is a suitable substitute for this requirement. For students without credit for BIOL 200, selecting BIOL 201 requires either CHEM 313 or CHEM 330.

⁹ With permission, CHEM 449 or 6 credits of CHEM 445 may be substituted for 3 credits of CHEM 445 and 3 credits of 400-level CHEM lecture electives.

¹⁰ Chosen from 300- and 400- level CHEM lecture courses. At least 3 credits must be chosen from 400-level CHEM lecture courses, excluding the credits associated with substitutions involving CHEM 445 or CHEM 449, as detailed in footnote 9.

<p>FIRST YEAR</p> <p>COMMUNICATION REQUIREMENT¹ 3</p> <p>CHEM 121 (111), 123 8</p> <p>MATH 100 OR 102 OR 104² 3</p> <p>MATH 101 OR 103 OR 105³ 3</p> <p>PHYS 100-LEVEL⁴ 6</p> <p>ELECTIVES^{5,6} 10</p> <p>TOTAL CREDITS 33</p>	<p>THIRD YEAR</p> <p>BIOL 201 (OR BIOC 202)⁸ 3</p> <p>CHEM 300¹ 3</p> <p>CHEM 304 3</p> <p>CHEM 311 3</p> <p>CHEM 312 3</p> <p>CHEM 319, 329 2</p> <p>CHEM 325, 345 4</p> <p>THREE OF CHEM 305, 313, 318, 327, 330 9</p> <p>ELECTIVES^{5,6} 3</p> <p>TOTAL CREDITS 33</p>
<p>SECOND YEAR</p> <p>CHEM 203⁷ 4</p> <p>CHEM 208, 218 6</p> <p>CHEM 211 4</p> <p>CHEM 213, 245 4</p> <p>MATH 200, 221 6</p> <p>ELECTIVES^{5,6} 9</p> <p>TOTAL CREDITS 33</p>	<p>FOURTH YEAR</p> <p>CHEM 412 3</p> <p>CHEM 449 6</p> <p>CHEM ELECTIVES^{6,9} 12</p> <p>ELECTIVES^{5,6} 12</p> <p>TOTAL CREDITS 33</p> <p>TOTAL CREDITS FOR DEGREE 132</p>

¹ Of the 6 credits of coursework is required to satisfy the Communication Requirement, 3 credits are specified in third year (CHEM 300). The remaining 3 credits must be chosen from the list of acceptable courses, see [Communication Requirement](#). ENGL credits beyond those needed to satisfy the Communication Requirement may be applied towards the Faculty of Science [Arts Requirement](#).

² MATH 180 or 184 or 120 may substitute for any of the specified differential calculus courses listed by decreasing the electives by 1 credit. MATH 110 may substitute for any of the specified differential calculus courses listed by decreasing the electives by 3 credits.

³ MATH 121 may substitute for any of the specified integral calculus courses listed by decreasing the electives by 1 credit.

⁴ Chosen from 100-level PHYS courses, excluding PHYS 100. PHYS 109 or 119 are recommended. Students without Physics 12 must take PHYS 100 before taking other 100-level PHYS courses.

⁵ Electives must be chosen to ensure the Faculty of Science [Arts Requirement](#) is met. Elective credits may be redistributed among the years in this specialization, provided the total number remains the same. The year level of an elective does not need to correspond to the year level of the specialization. Note that students in honours specializations must complete a minimum of 30 credits in each Winter Session. Students who do not have credit for Biology 11 or 12 must take 3 credits of 100-level BIOL (usually BIOL 111). Students with credit for Biology 11 or 12 must successfully complete 3 credits of an ASTR, BIOL, EOSC, or GEOB lecture course.

⁶ Students may elect to apply elective credits towards a [Specific Focus Area in Chemistry](#).

⁷ Students with CHEM 235 and a score of 76% or higher in CHEM 233 may apply for admission to this specialization and will be allowed to use CHEM 233 and 235 in place of CHEM 203.

⁸ BIOC 203 is a suitable substitute for this requirement. For students without credit for BIOL 200, selecting BIOL 201 requires either CHEM 313 or CHEM 330.

⁹ Chosen from 300- and 400- level CHEM lecture courses. At least 9 credits must be chosen from 400-level CHEM lecture courses.

COMBINED HONOURS BIOCHEMISTRY AND CHEMISTRY



CHEMISTRY
THE UNIVERSITY OF BRITISH COLUMBIA

<p>FIRST YEAR</p> <p>COMMUNICATION REQUIREMENT¹ 6</p> <p>BIOL 121, 140² 5</p> <p>CHEM 121 (111), 123 8</p> <p>MATH 100 OR 102 OR 104³ 3</p> <p>MATH 101 OR 103 OR 105⁴ 3</p> <p>PHYS 100-LEVEL⁵ 6</p> <p>ELECTIVES⁶ 2</p> <p>TOTAL CREDITS 33</p>	<p>THIRD YEAR</p> <p>BIOC 301, 303, 304 12</p> <p>BIOL 335 3</p> <p>CHEM 304 3</p> <p>CHEM 313 OR CHEM 330 3</p> <p>CHEM 319, 329 2</p> <p>LABORATORY REQUIREMENT⁹ 4</p> <p>ONE OF CHEM 218, 305, 311, 312, 327 3</p> <p>ELECTIVES⁶ 3</p> <p>TOTAL CREDITS 33</p>
<p>SECOND YEAR</p> <p>BIOC 203⁷ 3</p> <p>BIOL 200, 234 6</p> <p>CHEM 203⁸ 4</p> <p>CHEM 208, 211 7</p> <p>CHEM 213, 245⁵ 4</p> <p>MATH 200 3</p> <p>ELECTIVES⁶ 6</p> <p>TOTAL CREDITS 33</p>	<p>FOURTH YEAR</p> <p>BIOC 402, 404, 410 9</p> <p>ONE OF BIOC 403, 440, 450, 460 3</p> <p>BIOC 449 OR CHEM 449 6</p> <p>CHEM ELECTIVES¹⁰ 9</p> <p>ELECTIVES⁶ 6</p> <p>TOTAL CREDITS 33</p> <p>TOTAL CREDITS FOR DEGREE 132</p>

¹ A total of 6 credits of coursework is required to meet the Communication Requirement. For a full list of acceptable courses, see [Communication Requirement](#). Students taking CHEM 300 defer 3 credits of the Communication Requirement to third year.

² Students without Biology 11 or Biology 12 must take either BIOL 111 or BIOL 112 before taking BIOL 121 or BIOL 140.

³ MATH 180 or 184 or 120 may substitute for any of the specified differential calculus courses listed by decreasing the electives by 1 credit. MATH 110 may substitute for any of the specified differential calculus courses listed by decreasing the electives by 3 credits.

⁴ MATH 121 may substitute for any of the specified integral calculus courses listed by decreasing the electives by 1 credit.

⁵ Chosen from 100-level PHYS courses, excluding PHYS 100. PHYS 109 or 119 are recommended. Students without Physics 12 must take PHYS 100 before taking other 100-level PHYS courses.

⁶ Electives must be chosen to ensure the Faculty of Science [Arts Requirement](#) is met. Elective credits may be redistributed among the years in this specialization, provided the total number remains the same. The year level of an elective does not need to correspond to the year level of the specialization. Note that students in honours specializations must complete a minimum of 30 credits in each Winter Session.

⁷ Students with a mark of 76% or higher in BIOL 201 or BIOC 202 may apply for admission to this specialization and will be allowed to use these courses in place of BIOC 203. However, BIOC 203 is the preferred route into biochemistry specializations.

⁸ Students with CHEM 235 and a score of 76% or higher in CHEM 233 may apply for admission to this specialization and will be allowed to use CHEM 233 and 235 in place of CHEM 203.

⁹ Students select either a) CHEM 325 and CHEM 345 or b) CHEM 315 and CHEM 335 and BIOC 420. With option b), the number of electives is decreased by 1 credit, and BIOC 420 is taken in fourth year. Students should select the option best suited to their preference for fourth year thesis project.

¹⁰ Chosen from 300- and 400- level CHEM lecture courses. At least 6 credits must be chosen from 400-level CHEM lecture courses.

<p>FIRST YEAR</p> <p>COMMUNICATION REQUIREMENT¹ 3</p> <p>BIOL 112, 121, 140² 8</p> <p>CHEM 121 (111), 123 8</p> <p>MATH 100 OR 102 OR 104³ 3</p> <p>MATH 101 OR 103 OR 105⁴ 3</p> <p>PHYS 101⁵ 3</p> <p>ELECTIVES⁶ 5</p> <p>TOTAL CREDITS 33</p>	<p>THIRD YEAR</p> <p>BIOL 230 (OR 260), 300¹¹, 336¹² 9</p> <p>TWO OF BIOL 337, 340, 341, 351, 352¹³ 4</p> <p>CHEM 300¹, 313 6</p> <p>CHEM 315, 335¹⁴ 2</p> <p>CHEM 319, 329 2</p> <p>ONE OF CHEM 218, 305, 311, 327, 330 3</p> <p>ELECTIVES⁶ 7</p> <p>TOTAL CREDITS 33</p>
<p>SECOND YEAR</p> <p>BIOL 200, 201⁷, 234 9</p> <p>ONE OF BIOL 203, 204, 205, 209, 210 4</p> <p>CHEM 203⁸, 213, 245 8</p> <p>CHEM 205⁹, 208¹⁰, 211 10</p> <p>ELECTIVES⁶ 2</p> <p>TOTAL CREDITS 33</p>	<p>FOURTH YEAR</p> <p>BIOL 449 OR CHEM 449 6</p> <p>CHEM AND LIFE SCIENCE ELECTIVES¹⁵ 18</p> <p>ELECTIVES⁶ 9</p> <p>TOTAL CREDITS 33</p> <p>TOTAL CREDITS FOR DEGREE 132</p>

¹ Of the 6 credits of coursework is required to satisfy the Communication Requirement, 3 credits are specified in third year (CHEM 300). The remaining 3 credits must be chosen from the list of acceptable courses, see [Communication Requirement](#). ENGL credits beyond those needed to satisfy the Communication Requirement may be applied towards the Faculty of Science [Arts Requirement](#).

² Students without Biology 11 or Biology 12 must take either BIOL 111 before taking BIOL 112, 121 or 140.

³ MATH 180 or 184 or 120 may substitute for any of the specified differential calculus courses listed by decreasing the electives by 1 credit. MATH 110 may substitute for any of the specified differential calculus courses listed by decreasing the electives by 3 credits.

⁴ MATH 121 may substitute for any of the specified integral calculus courses listed by decreasing the electives by 1 credit.

⁵ PHYS 107 or 117 may substitute for PHYS 101. Students without Physics 12 must take PHYS 100 before taking other 100-level PHYS courses.

⁶ Electives must be chosen to ensure the Faculty of Science [Arts Requirement](#) and [Upper-level Requirement](#) are met. Elective credits may be redistributed among the years in this specialization, provided the total number remains the same. The year level of an elective does not need to correspond to the year level of the specialization. Note that students in honours specializations must complete a minimum of 30 credits in each Winter Session.

⁷ BIOC 202 or 203 are suitable substitutes for this requirement.

⁸ Students with CHEM 235 and a score of 76% or higher in CHEM 233 may apply for admission to this specialization and will be allowed to use CHEM 233 and 235 in place of CHEM 203.

⁹ CHEM 304 is an acceptable substitute for this requirement.

¹⁰ May be deferred to third year to allow space for additional electives.

¹¹ STAT 200 may replace BIOL 300 with permission of a Biology specialization advisor. Students who replace BIOL 300 must complete an additional 3 credits of BIOL numbered higher than 300.

¹² May be deferred to fourth year to allow space for additional electives.

¹³ BIOL 341 is recommended. BIOL 326, 363, 404, 409, 437, and 444 may also be included in this list of courses. If the credit total of the courses selected for this requirement exceeds 4, the excess may be applied towards BIOL lecture electives (see footnote 15).

¹⁴ CHEM 325 and 345 may be substituted for CHEM 315 and 335 and 2 credits of CHEM 300-level lecture electives.

¹⁵ Chosen from 300- and 400- level BIOC, BIOL, CAPS, CHEM, MICB, MRNE, or PHYL lecture courses, as well as ANAT 390, 391, EOSC 470, 471, 474, 475, 478, GEOB 307, 407, FNH 350, 351, 451, MATH 462, MEDG 410, 419, 420, 421, and PCTH 305. At least 6 credits must be chosen from BIOL lecture courses and at least 6 credits must be chosen from 400-level CHEM lecture courses. Recommended electives include BIOC 302, 303, 402, 410, BIOL 335, 361, 435, 436, 463, CHEM 411, 413, 435 and MICB 325, 405.



<p>FIRST YEAR</p> <p>COMMUNICATION REQUIREMENT¹ 3</p> <p>CHEM 121 (111), 123 8</p> <p>MATH 120² 4</p> <p>MATH 121³ 4</p> <p>PHYS 107, 108, 109⁴ 7</p> <p>ELECTIVES⁵ 6</p> <p>TOTAL CREDITS 32</p>	<p>THIRD YEAR</p> <p>CHEM 300¹, 304 6</p> <p>CHEM 211, 315 5</p> <p>CHEM 319, 329 2</p> <p>MATH 316 3</p> <p>PHYS 210, 301, 304, 309 (OR 319) 12</p> <p>PHYS AND CHEM ELECTIVES⁹ 3</p> <p>ELECTIVES⁵ 3</p> <p>TOTAL CREDITS 34</p>
<p>SECOND YEAR</p> <p>CHEM 203⁶ 4</p> <p>CHEM 208 3</p> <p>CHEM 213, 245 4</p> <p>MATH 215, 217⁷, 223, (221)⁸ 10</p> <p>PHYS 200, 216 7</p> <p>PHYS 219, 229 3</p> <p>ELECTIVES⁵ 3</p> <p>TOTAL CREDITS 34</p>	<p>FOURTH YEAR</p> <p>ONE OF BIOC 202, CHEM 305, 327 3</p> <p>CHEM 412 3</p> <p>CHEM 449 OR PHYS 449 6</p> <p>PHYS 401 OR 408¹⁰ 3</p> <p>ONE OF PHYS 306, 402, 403, 474 3</p> <p>PHYS AND CHEM ELECTIVES⁹ 9</p> <p>ELECTIVES⁵ 5</p> <p>TOTAL CREDITS 32</p> <p>TOTAL CREDITS FOR DEGREE 132</p>

¹ Of the 6 credits of coursework is required to satisfy the Communication Requirement, 3 credits are specified in third year (CHEM 300). The remaining 3 credits must be chosen from the list of acceptable courses, see [Communication Requirement](#). ENGL credits beyond those needed to satisfy the Communication Requirement may be applied towards the Faculty of Science [Arts Requirement](#).

² MATH 180 or 184 may substitute for MATH 120. MATH 100 or 102 or 104 may substitute for MATH 120 by increasing the electives by 1 credit. MATH 110 may substitute for MATH 120 by decreasing the electives by 3 credits.

³ MATH 101 or 103 or 105 may substitute for MATH 121 by increasing the electives by 1 credit.

⁴ PHYS 117, 118, and 119 may substitute for PHYS 107, 108, and 109. Students without Physics 12 must take PHYS 100 before taking other 100-level PHYS courses.

⁵ Electives must be chosen to ensure the Faculty of Science [Arts Requirement](#) is met. Elective credits may be redistributed among the years in this specialization, provided the total number remains the same. The year level of an elective does not need to correspond to the year level of the specialization. Note that students in honours specializations must complete a minimum of 30 credits in each Winter Session. Students who do not have credit for Biology 11 or 12 must take 3 credits of 100-level BIOL (usually BIOL 111). Students with credit for Biology 11 or 12 must successfully complete 3 credits of an ASTR, BIOL, EOSC, or GEOB lecture course.

⁶ Students with CHEM 235 and a score of 76% or higher in CHEM 233 may apply for admission to this specialization and will be allowed to use CHEM 233 and 235 in place of CHEM 203.

⁷ MATH 217 can be replaced by MATH 200 and 317.

⁸ MATH 223 (221) may be taken in first year.

⁹ Chosen from 300- and 400-level PHYS and CHEM lecture courses. At least 3 credits must be chosen from 400-level PHYS lecture courses and at least 3 credits must be chosen from 400-level CHEM lecture courses. PHYS 402, 410 are strongly recommended for students intending to pursue graduate work in physics. Recommended CHEM courses include CHEM 401, 402, 407, 408, 410, 417.

¹⁰ Students selecting PHYS 408 decrease the number of PHYS Electives by 1 credit.

COMBINED HONOURS CHEMISTRY AND MATHEMATICS



CHEMISTRY
THE UNIVERSITY OF BRITISH COLUMBIA

<p>FIRST YEAR</p> <p>COMMUNICATION REQUIREMENT¹ 3</p> <p>CHEM 121 (111), 123 8</p> <p>CPSC 110 4</p> <p>MATH 120² 4</p> <p>MATH 121³ 4</p> <p>PHYS 107, 108, 109⁴ 7</p> <p>ELECTIVES⁵ 3</p> <p>TOTAL CREDITS 33</p>	<p>THIRD YEAR</p> <p>CHEM 300¹, 304, 312 9</p> <p>CHEM 315 1</p> <p>CHEM 319, 329 2</p> <p>MATH 305⁹, 316, 318 9</p> <p>MATH 320, 321 6</p> <p>ELECTIVES⁵ 6</p> <p>TOTAL CREDITS 33</p>
<p>SECOND YEAR</p> <p>CHEM 203⁶ 4</p> <p>CHEM 208 3</p> <p>CHEM 211 4</p> <p>CHEM 213, 245 4</p> <p>CPSC 210 OR MATH 210⁷ 4</p> <p>MATH 215, 223 (OR 221) 6</p> <p>MATH 226 (OR 200)⁸, 227 (OR 317) 6</p> <p>ELECTIVES⁵ 2</p> <p>TOTAL CREDITS 33</p>	<p>FOURTH YEAR</p> <p>CHEM 412 3</p> <p>CHEM 449¹⁰ 6</p> <p>CHEM ELECTIVES¹¹ 3</p> <p>9 CREDITS FROM MATH 322, 323, 400-406, 412, 416-429, 433-440, 443, 449, 450 9</p> <p>PHYS 301 3</p> <p>ELECTIVES⁵ 9</p> <p>TOTAL CREDITS 33</p> <p>TOTAL CREDITS FOR DEGREE 132</p>

¹ Of the 6 credits of coursework is required to satisfy the Communication Requirement, 3 credits are specified in third year (CHEM 300). The remaining 3 credits must be chosen from the list of acceptable courses, see [Communication Requirement](#). ENGL credits beyond those needed to satisfy the Communication Requirement may be applied towards the Faculty of Science [Arts Requirement](#).

² MATH 180 or 184 may substitute for MATH 120. MATH 100 or 102 or 104 may substitute for MATH 120 by increasing the electives by 1 credit. MATH 110 may substitute for MATH 120 by decreasing the electives by 3 credits.

³ MATH 101 or 103 or 105 may substitute for MATH 121 by increasing the electives by 1 credit.

⁴ PHYS 117, 118, and 119 may substitute for PHYS 107, 108, and 109. Students without Physics 12 must take PHYS 100 before taking other 100-level PHYS courses.

⁵ Electives must be chosen to ensure the Faculty of Science [Arts Requirement](#) is met. Elective credits may be redistributed among the years in this specialization, provided the total number remains the same. The year level of an elective does not need to correspond to the year level of the specialization. Note that students in honours specializations must complete a minimum of 30 credits in each Winter Session. Students who do not have credit for Biology 11 or 12 must take 3 credits of 100-level BIOL (usually BIOL 111). Students with credit for Biology 11 or 12 must successfully complete 3 credits of an ASTR, BIOL, EOSC, or GEOB lecture course.

⁶ Students with CHEM 235 and a score of 76% or higher in CHEM 233 may apply for admission to this specialization and will be allowed to use CHEM 233 and 235 in place of CHEM 203.

⁷ Students selecting MATH 210 must increase the number of electives by 1 credit. MATH 210 may not be offered every year.

⁸ Students who take MATH 200 or who obtain less than 68% in MATH 226 must take MATH 220 and obtain 80% or higher in order to take the required course MATH 320.

⁹ MATH 300, 301 may substitute for MATH 305 by decreasing the electives by 3 credits.

¹⁰ Students in this specialization will typically select projects in physical or theoretical chemistry.

¹¹ Chosen from 400-level CHEM lecture courses. Recommended CHEM courses include CHEM 401, 402, 407, 408, 410, 417.

COMBINED MAJOR CHEMICAL BIOLOGY (NEW PROGRAM)



CHEMISTRY
THE UNIVERSITY OF BRITISH COLUMBIA

<p>FIRST YEAR</p> <p>COMMUNICATION REQUIREMENT¹ 3</p> <p>BIOL 112, 121, 140² 8</p> <p>CHEM 121 (111), 123 8</p> <p>MATH 100 OR 102 OR 104³ 3</p> <p>MATH 101 OR 103 OR 105⁴ 3</p> <p>PHYS 101⁵ 3</p> <p>ELECTIVES⁶ 2</p> <p>TOTAL CREDITS 30</p>	<p>THIRD YEAR</p> <p>BIOL 230 (OR 260), 300¹⁰ 6</p> <p>TWO OF BIOL 337, 340, 341, 351, 352¹² 4</p> <p>CHEM 208 3</p> <p>CHEM 300¹, 313 6</p> <p>CHEM 315, 335¹¹ 2</p> <p>ONE OF CHEM 218, 305, 311, 327, 330 3</p> <p>ELECTIVES⁶ 6</p> <p>TOTAL CREDITS 30</p>
<p>SECOND YEAR</p> <p>BIOL 200, 201⁷, 234 9</p> <p>ONE OF BIOL 203, 204, 205, 209, 210 4</p> <p>CHEM 203⁸, 213, 245 8</p> <p>CHEM 205⁹, 211 7</p> <p>ELECTIVES⁶ 2</p> <p>TOTAL CREDITS 30</p>	<p>FOURTH YEAR</p> <p>BIOL 336 3</p> <p>CHEM 445¹³ 3</p> <p>CHEM AND LIFE SCIENCE ELECTIVES¹⁴ 12</p> <p>ELECTIVES⁶ 12</p> <p>TOTAL CREDITS 30</p> <p>TOTAL CREDITS FOR DEGREE 120</p>

¹ Of the 6 credits of coursework is required to satisfy the Communication Requirement, 3 credits are specified in third year (CHEM 300). The remaining 3 credits must be chosen from the list of acceptable courses, see [Communication Requirement](#). ENGL credits beyond those needed to satisfy the Communication Requirement may be applied towards the Faculty of Science [Arts Requirement](#).

² Students without Biology 11 or Biology 12 must take either BIOL 111 before taking BIOL 112, 121 or 140.

³ MATH 180 or 184 or 120 may substitute for any of the specified differential calculus courses listed by decreasing the electives by 1 credit. MATH 110 may substitute for any of the specified differential calculus courses listed by decreasing the electives by 3 credits.

⁴ MATH 121 may substitute for any of the specified integral calculus courses listed by decreasing the electives by 1 credit.

⁵ PHYS 107 or 117 may substitute for PHYS 101. Students without Physics 12 must take PHYS 100 before taking other 100-level PHYS courses.

⁶ Electives must be chosen to ensure the Faculty of Science [Arts Requirement](#) and [Upper-level Requirement](#) are met. Elective credits may be redistributed among the years in this specialization, provided the total number remains the same. The year level of an elective does not need to correspond to the year level of the specialization.

⁷ BIOC 202 or 203 are suitable substitutes for this requirement.

⁸ Students with CHEM 235 and a score of 76% or higher in CHEM 233 may apply for admission to this specialization and will be allowed to use CHEM 233 and 235 in place of CHEM 203.

⁹ CHEM 304 is an acceptable substitute for this requirement.

¹⁰ STAT 200 may replace BIOL 300 with permission of a Biology specialization advisor. Students who replace BIOL 300 must complete an additional 3 credits of BIOL numbered higher than 300.

¹¹ CHEM 325 and 345 may be substituted for CHEM 315 and 335 and 2 credits of CHEM 300-level lecture electives.

¹² BIOL 341 is recommended. BIOL 326, 363, 404, 409, 437, and 444 may also be included in this list of courses. If the credit total of the courses selected for this requirement exceeds 4, the excess may be applied towards BIOL lecture electives (see footnote 15).

¹³ With permission, CHEM 449 or 6 credits of CHEM 445 may be substituted for 3 credits of CHEM 445 and 3 credits of 400-level CHEM lecture electives.

¹⁴ Chosen from 300- and 400- level BIOC, BIOL, CAPS, CHEM, MICB, MRNE, or PHYL lecture courses, as well as ANAT 390, 391, EOSC 470, 471, 474, 475, 478, GEOB 307, 407, FNH 350, 351, 451, MATH 462, MEDG 410, 419, 420, 421, and PCTH 305. At least 6 credits must be chosen from BIOL lecture courses and at least 6 credits must be chosen from 400-level CHEM lecture courses. Recommended electives include BIOC 302, 303, 402, 410, BIOL 335, 361, 435, 436, 463, CHEM 411, 413, 435 and MICB 325, 405.