BIOCHEMISTRY (BCHM)

Jan. 15, 2026

Program Advisors: **Chair: Professor J. Hollett**; **Professor:** D. Craig; **Associate Professors:** M. Eze, D. Vanderwel, T. Wood; **Instructor:** J. Galka

DEGREES/PROGRAMS OFFERED

3 -Year BSc
3-Year BSc (Business Stream)
4 -Year BSc
4-Year BSc (Business Stream)
Honours BSc

INTRODUCTION

This degree combines the information and methodologies of Biochemistry, Cell Biology, Genetics and Microbiology with the techniques of the physical sciences to investigate living systems. It is an Interdisciplinary Program which consists primarily of courses from the Departments of Biology and Chemistry. Students in the program will gain a thorough understanding of the molecular aspects of the structure, function and metabolism of living organisms. They will also obtain experience in up-to-date laboratory techniques and procedures. This is one of the most exciting areas of science at this time and students will be kept abreast of advances in the field and their impact on humans and other life forms.

The Program offers a 90 credit hour 3-Year BSc, a 120 credit hour 4-Year BSc and a 120 credit hour Honours BSc. Graduates will be well qualified to work in university, government, and other research laboratories or in the pharmaceutical and food industries. Graduates with a 4-Year BSc or Honours BSc could also proceed to graduate studies in the Life Sciences.

Students pursuing a 3-year or 4-year BSc in Biochemistry have the opportunity to take a Business Stream – a set of core courses in the Faculty of Business that will provide them with the skills needed to enter and succeed in industry and business. After completing the requirements of the BSc degree and the set of core courses indicated in the "Science with a Business Stream" section of the Calendar, it will be noted on the student's transcript that they have satisfied the requirements of a BSc degree with a Business stream

This program also provides excellent preparation for students wishing to enter professional schools in the health sciences.

REQUIREMENTS FOR A 3-YEAR BSc IN BIOCHEMISTRY

ADMISSION REQUIREMENT — Students must consult with a Program Advisor in planning their studies.

GRADUATION REQUIREMENT — 90 credit hours

RESIDENCE REQUIREMENT

Degree:	Minimum 30 credit hours
Major:	Minimum 18 credit hours

GENERAL DEGREE REQUIREMENT

Humanities:	12 credit hours in Humanities
Writing:	Minimum 3 credit hours of Academic Writing.
Indigenous:	3 credit hours in designated Indigenous requirement courses
Maximum Introductory Courses:	Students may use a maximum of 42 credit hours at the 1000 level. Of these, a maximum of 6 credit hours may be below the 1000 level. As a result, students must take a minimum of 48 credit hours at the 2000-level or above in order to not exceed the maximum number of introductory courses.
Distribution:	Minimum three (3) credit hours from each of five (5) different subjects.

MAJOR REQUIREMENT

Single Major:	Minimum 45 credit hours in the Major subject as per the Required Courses list.
Double Major:	Minimum 45 credit hours of required courses and credit hours in Biochemistry program and Specified number of credit hours in other Major (may vary depending on Interdisciplinary courses completed as they may be able to be credited to both Majors).

Required courses:

BIOL-1115(3)	Cells and Cellular Processes (or the former BIOL-1111(6))
BIOL-1116(3)	Evolution, Ecology and Biodiversity (or the former BIOL-1111(6))
BIOL-2301(3)	Genetics (or the former BIOL-3301(3))
BIOL-2902(3)	Biology of Bacteria and Archaea (formerly "Biology of the Prokaryotes and Viruses")
BIOL-3221(3)	Cell Biology
CHEM-1111(3)	Introduction to the Chemical Properties of Matter (or the former CHEM-1101(6))
CHEM-1112(3)	Basic Principles of Chemical Reactivity (or the former CHEM-1101(6))
CHEM-2202(3)	Organic Chemistry I (or the former CHEM-2201(6))
CHEM-2203(3)	Organic Chemistry II (or the former CHEM-2201(6))
CHEM-3502(3)	Intermediate Biochemistry I: Structure, Function, and Energetics of Biomolecules (or former CHEM-3501(6))

CHEM-3503(3) Intermediate Biochemistry II: Intermediary Metabolism (or the former CHEM-3501(6))
PHYS-1101(6) Foundations of Physics I OR **PHYS-1301(6)** Introduction to Physics

Minimum 3 credit hours in additional core chemistry, selected from the following:

CHEM-2102(3) Thermodynamics and Kinetics
CHEM-2103(3) Atoms, Molecules and Spectroscopy
CHEM-2302(3) Quantitative Chemical Analysis
CHEM-2401(3) Inorganic Chemistry I

Minimum 3 credit hours selected from the following courses:

PSYC-2101(3) Introduction to Data Analysis
STAT-1301 (3) **Statistical Analysis I**
STAT-1302 (3) **Statistical Analysis II**
STAT-1501(3) Elementary Biological Statistics I

9 additional credit hours from Biology and/or Biochemistry and/or Chemistry at or above the 2000 level (with the exception of the former CHEM-2501(3), CHEM-2601(6) and CHEM-2801(3)) to bring the total number of Biology, Biochemistry and Chemistry courses to 45 credit hours.

Recommended: MATH-1101(6) Introduction to Calculus **OR MATH-1103 (3)** Introduction to Calculus I **AND MATH-1104 (3)** Introduction to Calculus II. This course is required for the 4-Year, and Honours BSc in Biochemistry, and is a prerequisite for CHEM-2102(3), Thermodynamics and Kinetics; and CHEM-2103(3), Atoms, Molecules and Spectroscopy. Both CHEM-2102(3) and CHEM-2103(3) are options in the 3-Year, 4-Year, and Honours BSc in Biochemistry

Note: Students considering the four-year degree in Biochemistry should note that BIOL-3901(3) is a prerequisite for BIOL-4902(3); BIOL-2153(3) is a prerequisite for BIOL-3163(3).

Note: Students should design their course selection in consultation with one of the Program Advisors.

SUGGESTED PROGRAM OF STUDY- ***Students must consult with Program Advisors in planning their programs.***

Year 1

BIOL-1115(3) Cells and Cellular Processes
BIOL-1116(3) Evolution, Ecology and Biodiversity
CHEM-1111(3) Introduction to the Chemical Properties of Matter
CHEM-1112(3) Basic Principles of Chemical Reactivity
RHET-1103(3) Academic Writing: Sciences (if required)
STAT-1501(3) Elementary Biological Statistics I
xxxx.xxxx(6) Humanities
Electives* 6 credit hours

Year 2

BIOL-2301(3) Genetics
BIOL-2902(3) Biology of Bacteria and Archaea (formerly "Biology of the Prokaryotes and Viruses")
CHEM-2202(3) Organic Chemistry I
CHEM-2203(3) Organic Chemistry II
One of:
- CHEM-2102(3) Thermodynamics and Kinetics
- CHEM-2103(3) Atoms, Molecules and Spectroscopy
- CHEM-2302(3) Quantitative Chemical Analysis
- CHEM-2401(3) Inorganic Chemistry I

One of:
- PHYS-1301(6) Introduction to Physics
- PHYS-1101(6) Foundations of Physics I

Electives* 3 credit hours
xxxx.xxxx(6) Humanities

Note: (If Academic Writing is not required, Physics could be done in Year 1 and Statistics plus a 3 credit hour elective in Year 2)

Year 3

BIOL-3221(3) Cell Biology
CHEM-3502(3) Intermediate Biochemistry I: Structure, Function and Energetics of Biomolecules
CHEM-3503(3) Intermediate Biochemistry II: Intermediary Metabolism
Electives* 21 credit hours

***Electives:**

1) There is a requirement of a minimum of 45 credit hours in Biology, Biochemistry and Chemistry. This is made up of required courses plus an appropriate number of credit hours from the electives.
2) MATH-1101(6) Introduction to Calculus or the equivalent **MATH-1103 (3)** Introduction to Calculus I AND **MATH-1104 (3)** Introduction to Calculus II is ***strongly recommended***. This course is required for the 4-Year and Honours B.Sc. degrees in Biochemistry and is a prerequisite for CHEM-2102(3) Thermodynamics and Kinetics; and CHEM-2103(3), Atoms, Molecules and Spectroscopy. Both CHEM-2102(3) and CHEM-2103(3) are options in the 3-Year, 4-Year, and Honours BSc in Biochemistry
3) It is strongly recommended that students who may consider doing a 4-Year or Honours B.Sc. in Biochemistry take at least one additional core Chemistry course in the second or third year.

REQUIREMENTS FOR THE 3-YEAR BSc IN BIOCHEMISTRY WITH A BUSINESS STREAM

Students must complete the requirements of the 3-year BSc in Biochemistry degree (see previous section) and the set of core courses indicated in the "Science with a Business Stream" section of the Calendar.

REQUIREMENTS FOR A 4-YEAR BSc IN BIOCHEMISTRY

ADMISSION REQUIREMENT Students must consult with a Program Advisor in planning their studies.

GRADUATION REQUIREMENT 120 credit hours

RESIDENCE REQUIREMENT

Degree: Minimum 60 credit hours
Major: Minimum 30 credit hours

GENERAL DEGREE REQUIREMENT

Humanities: 12 credit hours
Writing: Minimum 3 credit hours of Academic Writing.
Indigenous: 3 credit hours in designated Indigenous requirement courses

Maximum Introductory Courses: Students may use a maximum of 42 credit hours at the 1000 level. Of these, a maximum of 6 credit hours may be below the 1000 level. As a result, students must take a minimum of 78 credit hours at the 2000-level or above in order to not exceed the maximum number of introductory courses.

Distribution: Minimum three (3) credit hours from each of five (5) different subjects.

MAJOR REQUIREMENT

Single Major: Minimum 69 credit hours in the Major subject as per Required Courses list.
Double Major: Minimum 69 credit hours of required courses and credit hours in Biochemistry program and specified number of credit hours in other Major; may vary depending on Interdisciplinary courses completed as they may be able to be credited to both Majors.

Required courses:

BIOL-1115(3) Cells and Cellular Processes (or the former BIOL-1111(6))
BIOL-1116(3) Evolution, Ecology and Biodiversity (or the former BIOL-1111(6))
BIOL-2301(3) Genetics (or the former BIOL-3301(3))
BIOL-2902(3) Biology of Bacteria and Archaea (formerly “Biology of the Prokaryotes and Viruses”)
BIOL-3221(3) Cell Biology
BIOL-3303(3) Molecular Genetics and Genomics (or the former BIOL-4302(3))
BIOL-4502(3) Molecular Cell Biology

Minimum 3 credit hours selected from the following physiology courses:

BIOL-3163(3) Plant Anatomy and Physiology
BIOL-3602(3) Comparative Animal Physiology I (or the former BIOL-3601(6))
BIOL-3603(3) Comparative Animal Physiology II (or the former BIOL-3601(6))
BIOL-4902(3) Microbial Physiology

CHEM-1111(3) Introduction to the Chemical Properties of Matter (or the former CHEM-1101(6))
CHEM-1112(3) Basic Principles of Chemical Reactivity (or the former CHEM-1101(6))
CHEM-2202(3) Organic Chemistry I (or the former CHEM-2201(6))
CHEM-2203(3) Organic Chemistry II (or the former CHEM-2201(6))
CHEM-3502(3) Intermediate Biochemistry I: Structure, Function, and Energetics of Biomolecules (or the former CHEM-3501(6))
CHEM-3503(3) Intermediate Biochemistry II: Intermediary Metabolism (or the former CHEM-3501(6))
CHEM-4502(3) Molecular Enzymology
CHEM-4506(3) Methods in Biochemistry (or the former CHEM-4505(3))
MATH-1101(6) Introduction to Calculus
OR MATH-1103 (3) Introduction to Calculus I **AND MATH-1104 (3)** Introduction to Calculus II
PHYS-1101(6) Foundations of Physics I **OR PHYS-1301(6)** Introduction to Physics

Minimum 6 credit hours in additional core chemistry, selected from the following:

CHEM-2102(3) Thermodynamics and Kinetics **OR** CHEM**-2103(3)** Atoms, Molecules and Spectroscopy
CHEM-2302(3) Quantitative Chemical Analysis
CHEM-2401(3) Inorganic Chemistry I

Minimum 3 credit hours selected from the following statistics courses:

PSYC-2101(3) Introduction to Data Analysis;
STAT-1301 (3) **Statistical Analysis I**
STAT-1302 (3) **Statistical Analysis II**
STAT-1501(3) Elementary Biological Statistics I

15 additional credit hours from Biology and/or Biochemistry and/or Chemistry at or above the 2000 level (with the exception of the former CHEM-2501(3), CHEM-2601(6) and CHEM-2801(3)) to bring the total number of Biology and Chemistry courses to 69 credit

hours. Students may not count both **BIOL-4111(6)** Biology Honours Thesis and **CHEM-4701(6)** Research Projects in Chemistry towards the Biochemistry major.

Recommended: Students planning on graduate studies should seriously consider taking either **BIOL-4111(6)** Biology Honours Thesis or **CHEM-4701(6)** Research Projects in Chemistry.
Note: Students should design their course selection in consultation with one of the Program Advisors.

SUGGESTED PROGRAM OF STUDY

Students must consult with Program Advisors in planning their programs.

Year 1
BIOL-1115(3) Cells and Cellular Processes
BIOL-1116(3) Evolution, Ecology and Biodiversity
CHEM-1111(3) Introduction to the Chemical Properties of Matter
CHEM-1112(3) Basic Principles of Chemical Reactivity
MATH-1101(6) Introduction to Calculus
OR MATH-1103 (3) Introduction to Calculus I AND **MATH-1104 (3)** Introduction to Calculus II
RHET-1103(3) Academic Writing: Sciences (if required)
STAT-1501(3) Elementary Biological Statistics I
xxxx.xxxx(6) Humanities

Year 2
BIOL-2301(3) Genetics
BIOL-2902(3) Biology of Bacteria and Archaea (formerly "Biology of the Prokaryotes and Viruses")
CHEM-2202(3) Organic Chemistry I
CHEM-2203(3) Organic Chemistry II
One of:
- CHEM-2102(3) Thermodynamics and Kinetics
- CHEM-2103(3) Atoms, Molecules and Spectroscopy
- CHEM-2302(3) Quantitative Chemical Analysis
- CHEM-2401(3) Inorganic Chemistry I

One of:
- PHYS-1301(6) Introduction to Physics
- PHYS-1101(6) Foundations of Physics I

Electives* 3 credit hours
xxxx.xxxx(6) Humanities

Note: (If Academic Writing is not required, Physics could be done in Year 1 and Statistics plus a 3 credit hour elective in Year 2)

Year 3
BIOL-3221(3) Cell Biology
CHEM-3502(3) Intermediate Biochemistry I: Structure, Function and Energetics of Biomolecules
CHEM-3503(3) Intermediate Biochemistry II: Intermediary Metabolism
One of:
- CHEM-2102(3) Thermodynamics and Kinetics
- CHEM-2103(3) Atoms, Molecules and Spectroscopy
- CHEM-2302(3) Quantitative Chemical Analysis
- CHEM-2401(3) Inorganic Chemistry I

Electives* 18 credit hours

Year 4
BIOL-3303(3) Molecular Genetics and Genomics
BIOL-4502(3) Molecular Cell Biology
CHEM-4502(3) Molecular Enzymology
CHEM-4506(3) Methods in Biochemistry
Electives* 12 credit hours

***Electives:**
1) There is a requirement of a minimum of 69 credit hours in Biology, Biochemistry and Chemistry. This is made up of required courses plus an appropriate number of credit hours from the electives.
2) Note the 3 credit hour requirement for a course in Physiology. Some physiology courses have prerequisites.
3) Students considering graduate study should seriously consider BIOL-4111(6) Biology Honours Thesis OR CHEM-4701(6) Research Projects in Chemistry.

REQUIREMENTS FOR THE 4-YEAR BSc IN BIOCHEMISTRY WITH A BUSINESS STREAM

Students must complete the requirements of the 4-year BSc in Biochemistry degree (see previous section) and the set of core courses indicated in the "Science with a Business Stream" section of the Calendar

REQUIREMENTS FOR AN HONOURS BSc IN BIOCHEMISTRY

ADMISSION REQUIREMENT Students must consult with a Program Advisor in planning their studies.

GRADUATION REQUIREMENT 120 credit hours

Graduation G.P.A. Requirement: To graduate with a BSc Honours, students must have a minimum GPA of 3.0 in all Chemistry, Biochemistry and Biology courses (calculated on all course attempts in Biology, Biochemistry and Chemistry) and a 2.75 GPA in all non-major courses (calculated as for a 3-year degree where F's are not included and, in the case of repeated courses, only the highest grade will be used).

RESIDENCE REQUIREMENT

Degree: Minimum 60 credit hours

Major: Minimum 30 credit hours

GENERAL DEGREE REQUIREMENT

Humanities: 12 credit hours

Writing: Minimum 3 credit hours of Academic Writing.

Indigenous: 3 credit hours in designated Indigenous requirement courses

Maximum Introductory Courses: Students may use a maximum of 42 credit hours at the 1000 level. Of these, a maximum of 6 credit hours may be below the 1000 level. As a result, students must take a minimum of 78 credit hours at the 2000-level or above in order to not exceed the maximum number of introductory courses.

Distribution: Minimum three (3) credit hours from each of five (5) different subjects.

MAJOR REQUIREMENT

Single Major: Minimum 69 credit hours in the Major subject as per Required Courses list.

Double Major: Minimum 69 credit hours of required courses and credit hours in Biochemistry program and specified number of credit hours in other Major; may vary depending on Interdisciplinary courses completed as they may be able to be credited to both Majors.

Required courses:

BIOL-1115(3) Cells and Cellular Processes (or the former BIOL-1111(6))
BIOL-1116(3) Evolution, Ecology and Biodiversity (or the former BIOL-1111(6))
BIOL-2301(3) Genetics (or the former BIOL-3301(3))
BIOL-2902(3) Biology of Bacteria and Archaea (formerly "Biology of the Prokaryotes and Viruses")
BIOL-3221(3) Cell Biology
BIOL-3303(3) Molecular Genetics and Genomics (or the former BIOL-4302(3))
BIOL-4111(6) Biology Honours Thesis
OR **CHEM-4701(6)** Research Projects in Chemistry
BIOL-4502(3) Molecular Cell Biology
CHEM-1111(3) Introduction to the Chemical Properties of Matter (or the former CHEM-1101(6))
CHEM-1112(3) Basic Principles of Chemical Reactivity (or the former CHEM-1101(6))
CHEM-2102(3) Thermodynamics and Kinetics
CHEM-2202(3) Organic Chemistry I (or the former CHEM-2201(6)
CHEM-2203(3) Organic Chemistry II (or the former CHEM-2201(6))
CHEM-2302(3) Quantitative Chemical Analysis
CHEM-2401(3) Inorganic Chemistry I
CHEM-3502(3) Intermediate Biochemistry I: Structure, Function, and Energetics of Biomolecules (or the former CHEM-3501(6))
CHEM-3503(3) Intermediate Biochemistry II: Intermediary Metabolism (or the former CHEM-3501(6))
CHEM-4502(3) Molecular Enzymology
CHEM-4506(3) Methods in Biochemistry (or the former CHEM- 4505(3))
MATH-1101(6) Introduction to Calculus or the equivalent **MATH-1103 (3)** Introduction to Calculus I AND **MATH-1104 (3)** Introduction to Calculus II
PHYS-1101(6) Foundations of Physics I
OR **PHYS-1301(6)** Introduction to Physics)

Minimum 3 credit hours selected from the following physiology courses:

BIOL-3163(3) Plant Anatomy and Physiology
BIOL-3602(3) Comparative Animal Physiology I (or the former BIOL-3601(6))
BIOL-3603(3) Comparative Animal Physiology II (or the former BIOL-3601(6))
BIOL-4902(3) Microbial Physiology

Minimum 3 credit hours selected from the following statistics courses:

PSYC-2101(3) Introduction to Data Analysis
STAT-1301 (3) **Statistical Analysis I**
STAT-1302 (3) **Statistical Analysis II**
STAT-1501(3) Elementary Biological Statistics I

6 additional credit hours from Biology and/or Biochemistry and/or Chemistry at or above the 2000 level (with the exception of the former CHEM-2501(3), CHEM-2601(6) and CHEM-2801(3)) to bring the total number of Biology, Biochemistry and Chemistry courses to 69 credit hours. Students may not count both **BIOL-4111(6)** Biology Honours Thesis and **CHEM-4701(6)** Research Projects in Chemistry towards the Biochemistry major.

Note: Students should design their course selection in consultation with one of the Program Advisors.

SUGGESTED PROGRAM OF STUDY

Students must consult with Program Advisors in planning their programs.

Year 1

BIOL-1115(3) Cells and Cellular Processes
BIOL-1116(3) Evolution, Ecology and Biodiversity
CHEM-1111(3) Introduction to the Chemical Properties of Matter
CHEM-1112(3) Basic Principles of Chemical Reactivity
MATH-1101(6) Introduction to Calculus
OR MATH-1103 (3) Introduction to Calculus I **AND** MATH-1104 (3) Introduction to Calculus II
RHET-1103(3) Academic Writing: Sciences (if required)
STAT-1501(3) Elementary Biological Statistics I
xxxx.xxxx(6) Humanities

Year 2

BIOL-2301(3) Genetics
BIOL-2902(3) Biology of Bacteria and Archaea (formerly "Biology of the Prokaryotes and Viruses")
CHEM-2202(3) Organic Chemistry I
CHEM-2203(3) Organic Chemistry II
Two of:
CHEM-2102(3) Thermodynamics and Kinetics **OR** CHEM-2103(3) Atoms, Molecules and Spectroscopy
CHEM-2302(3) Quantitative Chemical Analysis
CHEM-2401(3) Inorganic Chemistry I
One of:
PHYS-1301(6) Introduction to Physics
PHYS-1101(6) Foundations of Physics I
xxxx.xxxx(6) Humanities
Note: (If Academic Writing is not required, Physics could be done in Year 1 and Statistics plus a 3 credit hour elective in Year 2)

Year 3

BIOL-3221(3) Cell Biology
CHEM-3502(3) Intermediate Biochemistry I: Structure, Function and Energetics of Biomolecules
CHEM-3503(3) Intermediate Biochemistry II: Intermediary Metabolism
Remaining one of:
CHEM-2102(3) Thermodynamics and Kinetics
CHEM-2103(3) Atoms, Molecules and Spectroscopy
CHEM-2302(3) Quantitative Chemical Analysis
CHEM-2401(3) Inorganic Chemistry I
Electives* 18 credit hours

Year 4

BIOL-3303(3) Molecular Genetics and Genomics
BIOL-4502(3) Molecular Cell Biology
CHEM-4502(3) Molecular Enzymology
CHEM-4506(3) Methods in Biochemistry
BIOL-4111(6) Biology Honours Thesis **OR** CHEM-4701(6) Research Projects in Chemistry
Electives* 12 credit hours

***Electives:**

1) There is a requirement of a minimum of 69 credit hours in Biology, Biochemistry and Chemistry. This is made up of required courses plus an appropriate number of credit hours from the electives.
2) Note the 3 credit hour requirement for a course in Physiology. Some physiology courses have prerequisites.

GENERAL INFORMATION

Prerequisites

Chemistry 40S **AND** either Pre-Calculus Mathematics 40S **OR** Applied Mathematics 40S are required for registration in both **BIOL-1115(3)** Cells and Cellular Processes and **CHEM-1111(3)** Introduction to the Chemical Properties of Matter. Physics 40S AND either Pre-Calculus Mathematics 40S or Applied Mathematics 40S are required for registration in **PHYS-1101(6)** Foundations of Physics I. Physics 40S is not required for registration in **PHYS-1301(6)** Introduction to Physics.

Entrance to Program

Students normally enter the Program in Year 2 of their studies.

Note: Course Listings and Descriptions can be found under the appropriate Departmental listings:

Biology (BIOL)
Biochemistry (BCHM)
Chemistry (CHEM)
Mathematics (MATH)
Physics (PHYS)
Psychology (PSYC)
Statistics (STAT)

COURSE LISTINGS

Students should use Web Advisor to find the courses to be offered in an upcoming term. A number of senior courses are offered on a rotation basis and are given in alternate years. Students are advised to consult with the Chair, Department of Chemistry in advance when planning their curriculum.

MULT/BCHM-2119(3): Topics in Diseases and Policy
MULT/BCHM-4119(4.5): Topics in Diseases and Policy

COURSE DESCRIPTIONS

All course descriptions for all undergraduate programs can now be found in one large PDF called “Course Descriptions” in the “Academic Calendar” section of the University website:
http://uwinnipeg.ca/academics/calendar/index.html