



UNIVERSITY
OF MANITOBA

Department of Microbiology

Faculty of Science

information for prospective students

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What is Microbiology?

Microbiology is the study of bacteria, viruses, fungi, protozoa and algae. Studies of these microorganisms and their interactions with the environment and other organisms, including humans, are of major importance in medicine, agriculture and ecology. Microbes such as bacteria and yeasts are model systems for the study basic life molecular biology, genetics, biochemistry, and biotechnology. Consequently, career opportunities in microbiology are extremely varied and may include:

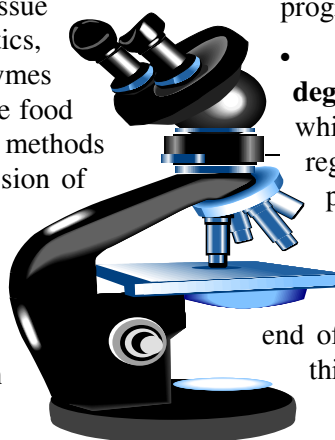
- **Medical microbiology and public health:** The identification, treatment and study of pathogenic bacteria (e.g., those causing Lyme disease, flesh-eating disease) and viruses (e.g., HIV, hepatitis). The control of communicable diseases and the monitoring of food and water supplies for infectious diseases (e.g., hamburger disease).
- **Microbial ecology:** The study of the role of microorganisms in the cycling of carbon, nitrogen, and sulphur, in soil and water. The monitoring of the environment and the use of microorganisms in bioremediation to reduce pollution (e.g., oil spills).
- **Biotechnology and industrial microbiology:** The use of microorganisms and animal tissue cultures for production of antibiotics, vaccines, alcohols, vitamins, and enzymes using recombinant DNA technology. In the food and dairy industries, microbiologists find methods to prevent spoilage of foods and transmission of food-borne diseases.
- **Basic research in microbiology, molecular biology, biochemistry and genetics:** These studies cover many different topics and may be conducted in universities, hospitals, industry, and

commercial research companies. This will involve the search for microbial products of therapeutic and commercial value (antibodies, anti-cancer drugs).

Program planning in Microbiology

The Department of Microbiology offers programs in Microbiology, Biochemistry, Biotechnology and Genetics. Some are offered jointly with the Department of Chemistry and other departments and faculties in the University.

- **General Degree including Microbiology:** A three year program with minimal specialization in Microbiology. It is a general overview and is useful for all sorts of jobs with some scientific basis.
- **Major Degree in Microbiology:** An intensive and specialized four year program of study. By careful choice of options a student may emphasize areas of special interest, e.g., medical aspects of microbiology, microbial ecology, molecular biology, or molecular genetics.
- **Honours degree in Microbiology:** Similar to the Major program, but provides opportunity for participation in laboratory research. A higher standard of grades must be maintained in this program.
- **Cooperative Major and Honours degrees in Microbiology:** Five year programs in which University 1 and Year 2 are the same as the regular Major and Honours programs. The programs alternate academic terms with terms of paid employment, providing a minimum of 12 months of work experience in research and industry. Students may apply at the end of second year and enter the program in their third year.



Courses required in Microbiology programs

University 1

- Microbiology I (MBIO 1010) may be taken in year 2 Biology 1 (BIOL 1020)
- Biology 2 (BIOL 1030)
- University I Chemistry (CHEM 1300 and CHEM 1310)
- 6 credit hours from the Faculty of Arts, of which 3 credit hours should satisfy the University's written English requirement.

Over University 1 and Year 2

Students are required to take:

- Basic Statistical Analysis 1 (STAT 1000)

And 3 credit hours from the following:

- General Physics 1 (PHYS 1020)
- Physics 1: Mechanics (PHYS 1050)
- Elements of Discrete Mathematics (MATH 1200)
- Vector Geometry and Linear Algebra (MATH 1300)
- Introduction to Calculus (MATH 1500)

Year 2

Major and Honours also require:

- Microbiology II (MBIO 2020)
- Biochemistry 1 & 2 (CHEM/MBIO 2360 and CHEM/MBIO 2370)
- Genetics 1 (BIOL 2500)
- Introductory Organic Chemistry 1 & 2 (CHEM 2210 and CHEM 2220)
- Cell Biology (BIOL 2520)

Honours also requires:

- Microbial Ecology (MBIO 2280)

Year 3

Students entering all Microbiology programs starting in the Fall 2011 will be required to take MBIO 3010, MBIO 3410 and MBIO 3030 (or the former MBIO 2100). Students in Cooperative option must take MBIO 3010 and MBIO 3410 prior to their first work term.

Senior microbiology courses are being updated – check for updates in Winter term 2011 at: http://umanitoba.ca/faculties/science/student_resources/830.htm

Joint Microbiology-Chemistry Programs in Biochemistry

Biochemistry is the study of the chemical composition, activity and constituents of living systems. There are two programs in biochemistry — Honours and Four Year Major and each one has its Cooperative Option. Both are intensive four or five year programs with an emphasis on the borderline between biology and chemistry. These programs are given in cooperation with the Department of Chemistry. The Cooperative Honours and Major degrees in Biochemistry are five year programs in which University 1 and Year 2 are the same as the regular programs. The program alternates academic terms with terms of paid employment, providing a minimum of 12 months of work experience in research and industry. Students may enter the program in their third year, and apply at the end of second year.

Courses required in Biochemistry programs:

University 1

- University 1 Chemistry (CHEM 1300 and CHEM 1310)
- Biology 1 & 2 (BIOL 1020 and BIOL 1030)
- Physics 1: Mechanics (PHYS 1050) and Physics 2: Waves & Modern Physics (PHYS 1070)
or
General Physics 1 & 2 (PHYS 1020 and PHYS 1030)
- Introduction to Calculus (MATH 1500) or equivalent
Calculus II (MATH 1700)
3 credit hours of COMP, MATH or STAT (restrictions apply - see General Calendar for acceptable choices)
- Of the six hours from the Faculty of Arts that are required in University 1, three credit hours should be from the list of courses that fulfils the University's written English requirement.

Courses required in Biochemistry programs:

Year 2

- Microbiology I and II (MBIO 1010 and MBIO 2020)
- Biochemistry 1 & 2 (CHEM/MBIO 2360 and CHEM/MBIO 2370)
- Introductory Organic Chemistry 1& 2 (CHEM 2210 and CHEM 2220)
- Physical Chemistry (CHEM 2280)
Chemistry of the Main Group Elements (CHEM 2380) and Analytical Chemistry (CHEM 2470)

Year 3

Students in Cooperative option must take MBIO 3410 prior to their first work term.

Joint Microbiology-Chemistry Honours Programs in Biotechnology

Biotechnology is the application of the principles of chemistry, biochemistry and microbiology to the development of new technologies. There are two programs in biotechnology — Honours and Four Year Major and each one has its Cooperative Option. The Joint Honours program is an intensive four year program in which students receive broad exposure to theoretical concepts and practical training in many areas of applied modern science. It includes a mixture of courses in microbiology, chemistry, molecular biology and genetics, with an emphasis on the use of new technology, such as recombinant DNA technology, to solve basic and applied problems in biology. The Cooperative Honours and Major degrees in Biotechnology are five year programs in which University 1 and Year 2 are the same as the regular programs. The program alternates academic terms with terms of paid employment, providing a minimum of 12 months of work experience in research and industry. Students may enter the program in their third year. The Biotechnology program is offered jointly by the Departments of Microbiology and Chemistry. The first two years are identical to the Biochemistry programs except:

University 1

- Mathematics requirements are MATH 1500 and MATH 1700, or MATH 1690.

Year 2:

- Microbial Ecology (MBIO 2280) and Genetics I (BIOL 2500) are required instead of the two mathematics courses.

Year 3

- Students in Cooperative option must take MBIO 3410 prior to their first work term.

For further information

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Note: *In the event of any inconsistencies between the information in this Infosheet and the University's annual General Calendar, the Calendar entry shall prevail. The effective date of information provided in this Infosheet is September 2010.*

For information on the Co-op Program

Please contact:

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