Molecular Life and Health Sciences

Degree conferred
Master of Science in Molecular Life and Health Sciences

Options
Five options are available:

- Developmental Biology and Regeneration
- Biochemistry and Cell Biology
- Neurobiology
- Marine Biology
- Teaching

Languages of study
Study in English

Commencement of studies
Commencement of studies in the Autumn Semester (September) or in the Spring Semester (February).
You are recommended to commence your studies in the autumn semester (September).

Access to further studies
This master programme qualifies students for the doctoral programmes **Biology**, **Biochemistry**, **Bioinformatics** and **Medical Sciences**.
Access is also possible with the 90 ECTS «Teaching» option, but a complement might be required, depending on the Institution and the doctoral programme.

The Department of Biology of the Faculty of Science and Medicine offers this multidisciplinary master programme with five different options that address molecular aspects in organisms ranging from yeast to mammals. The *Master of Science in Molecular Life and Health Sciences* provides a solid background including aspects on understanding human disease and animal development. This programme gives to the student the opportunity to acquire advanced theoretical background on molecular topics, hands-on experience in the laboratory, and the ability to communicate science. Master's students are integrated in research teams and thus gain extensive experience in fundamental academic research.

Profile of the study programme

The study of biology opens the doors to a fascinating world, from biomolecules and their regulation to the analysis of behaviour. The University of Fribourg offers a multidisciplinary study programme leading to the degree of *Master of Science in Molecular Life and Health Sciences*, placing a special emphasis on the development of students' scientific capabilities, such as independent thinking, problem-solving skills, critical evaluation of data, oral and written communication skills, and the ability to work in a team. English is the main language for all activities, but students can choose to take their exams in English, French or German.

As a master's student, you will deepen your knowledge of modern biological sciences and acquire techniques needed in basic research as well as in practical applications of academic research. The courses, obligatory and elective, are accompanied by discussions, presentations by students and project writing exercises. An agreement with the Universities of Bern and Neuchâtel (BENEFRI Framework Convention) allows you to take elective courses in these Institutions and have them credited for the study programme in Fribourg. The master thesis (60 ECTS credits for the 120 ECTS research options, and 45 ECTS credits for the 90 ECTS «Teaching» option) is carried out in one of the research teams, giving the student the opportunity to experience all aspects of the daily life of a research scientist, learning to plan, carry out, analyse, and present research. You may also have the possibility to participate in teaching practical courses and other assisting activities for which you are paid by the hour.

This consecutive *Master of Science in Molecular Life and Health Sciences* is accessible to students who have completed their Bachelor of Science in Biology or in Biochemistry at the University of Fribourg. Some restrictions apply, as outlined in the BSc and MSc study plans.

The Department of Biology of the Faculty of Science and Medicine offers five options for the *Master of Science in Molecular Life and Health Sciences*:

1. Developmental Biology and Regeneration (120 ECTS credits)
This option is centred on the molecular mechanisms that govern animal development in various model systems including the fruit fly *Drosophila melanogaster*, the nematode *Caenorhabditis elegans* and the zebrafish *Danio rerio*. Research groups investigate molecular aspects of regeneration, cell differentiation, epigenetics, gamete formation and aging. Our research focuses on fundamental aspects of molecular genetics and cell biology, and often correlates with perspectives on understanding human diseases. The tools employed are among others, molecular genetics, molecular biology, protein analysis, microscopy and imaging, and morphology.

2. Biochemistry and Cell Biology (120 ECTS credits)
This option puts special emphasis on molecular mechanisms regulating health and their dysregulation in disease. Biomolecules regulating the internal clock, nutrient sensing and growth control, lipid metabolism and membrane biogenesis, ribosome biogenesis, and stress responses are analysed by classical biochemical, 'omics', and computational biology approaches. In addition to mammals, especially human cell culture lines, the organisms studied are the mouse and the unicellular eukaryotic fungus *Saccharomyces cerevisiae* (Baker's yeast). The combination of model systems and approaches allows fascinating and detailed studies of gene functions, regulation of cell homeostasis and its dysregulation in human diseases.

3. Neurobiology (120 ECTS credits)

The brain remains one of the biggest unresolved mysteries in life sciences. This option is focussed on the nervous system, exploring how it functions on different conceptual levels, ranging from genes and genetics, over behaviour and circuits to neurodegeneration. An array of different animal models are used including the fruit fly *Drosophila melanogaster*, the nematode *Caenorhabditis elegans*, the cnidarian *Nematostella vectensis*, cephalopods, and the mouse. Research groups engage integrative approaches to investigate neural stem cells and cancer, cell differentiation and connectivity, sensory systems, behaviour, learning and memory, and neurodegeneration. The tools employed are molecular genetics, molecular biology, protein analysis, microscopy and imaging, behavioural analysis and many more.

4. Marine Biology (120 ECTS credits)
Oceans harbour the largest diversity of animals, are the core ecosystem impacting climate and are of large economical importance for food production. However, much remains unknown on the biodiversity of marine animals and particularly about the genomes, physiological and molecular adaptions in diverse environments. This option focuses on animals in the marine environment, their biodiversity, and investigates how relevant features emerged in evolution. It provides an overview on behavioural, molecular, physiological, neuronal and developmental mechanisms in Xenocoelomorpha, Cnidarians, and Cephalopods. The curriculum includes several hands-on courses and workshops at leading Marine Stations in Europe.

5. Teaching (90 ECTS credits)
This option is only accessible to future teachers who need to acquire also 30 additional ECTS credits in a second teaching subject. The programme combines courses from the 4 research options above, as well as elective and practical courses on a wide range of biological topics, and will therefore be of particular interest to students wishing to bolster a broad vision of biology. Master's students are integrated in research teams and have the opportunity to experience all aspects of the life of a research scientist, gaining a solid experience in academic research on topics such as development and regeneration, neurobiology, cell biology, biochemistry, and marine biology.

Academic and professional openings
The 120 ECTS master programme in Molecular Life and Health Sciences prepares students for careers inside and outside academia. For example, holders of this MSc degree find job opportunities as researchers in biotech companies, in laboratories for quality control (pharmaceutical or alimentary industry), as laboratory manager, biosafety officer or scientific collaborator at various offices and departments of the Swiss Confederation, sales representative for biotech companies, and other jobs related to animal and human health, molecular life sciences, and biochemistry. It also gives access to the DEEM/LDM and is therefore suitable for future teachers at the secondary level II. In other words, with a master programme in Molecular Life and Health Sciences, you can apply for positions that require a solid knowledge in molecular biology, the ability to communicate and to view science under a critical angle, and practical experience and skills. The master's degree also paves the way to doctoral studies (PhD). During their PhD, students learn how to conduct independent research, receive a salary and are exposed to the international research community through meetings and publications. Doctoral studies followed by a postdoctoral experience represent the typical way to access academic positions as well as positions in the upper management of industry in Switzerland and abroad.
Although the 90 ECTS «Teaching» option is specifically designed for future teachers at secondary level II, students will be well prepared for careers inside and outside academia. The master programme in Molecular Life and Health Sciences, option «Teaching» also gives access to doctoral studies (PhD), but a complement of up to 30 ECTS credits might be required, depending on the institution.

Studies organisation

Structure of studies

120 ECTS credits, 4 semesters
or
90 ECTS credits, 3 semesters (option «Teaching»)

Curriculum

http://studies.unifr.ch/go/vBvMa

Comments

The master programme **Environmental Biology** is also offered by the Department of Biology.

Admission

Master's degree programmes are built on the knowledge and abilities that were acquired when obtaining a bachelor's degree.

Holders of a bachelor's degree awarded by a Swiss university are admitted to a master's degree programme without any preconditions if they have earned 60 or 90 ECTS credits – depending on the chosen master's degree programme – within the corresponding discipline. However, additional requirements can be required. The same applies to holders of a bachelor's degree awarded by a foreign university, provided that the bachelor's degree is recognised and considered equivalent by the University of Fribourg.

Holders of a bachelor's degree awarded by a Swiss or a foreign university, provided that the bachelor's degree is recognised and considered equivalent by the University of Fribourg, who do not fulfil this condition can be admitted to a master's degree programme with preconditions (which must be successfully completed before starting the master's degree programme) and/or additional requirements (which can be completed during the master's degree programme). The preconditions and/or additional requirements may not exceed 60 ECTS credits in total. The same applies to holders of a bachelor's degree awarded by a Swiss university of applied sciences, according to existing agreements.

The respective conditions of admission for each master's degree programme are reserved.

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