Biochemistry

Degree conferred
Bachelor of Science in Biochemistry

Languages of study
Study in French and German

Commencement of studies
Commencement of studies only in the Autumn Semester (September)

Access to further studies
This bachelor programme qualifies students for the master programmes **Molecular Life and Health Sciences** and **Environmental Biology**

The bachelor programme in biochemistry is devoted to the study of fundamental chemical and physical processes in living organisms. It comprises molecular studies with a specific focus on enzymes and their role as catalysts in chemical reactions. A main interest is the study of cellular functions including the mechanisms involved in cell proliferation and development. Students also learn techniques for analysing DNA and genetic information as an integral part of the study programme. The biochemistry course thus gives students an opportunity to familiarise themselves with practical laboratory methods that are applied in several disciplines. It requires knowledge of the research tools used in chemistry and biology (microscopy, spectrometry, DNA sequencing, etc.). A command of bioinformatics tools is also essential to be able to store, manage and interpret the overwhelming volume of data provided by current analytical techniques.

Profile of the study programme

Biochemistry involves the study of fundamental chemical and physical processes within living organisms. It focuses especially on molecules such as proteins, lipids, carbohydrates and nucleic acids. The topics studied cover fundamental functional aspects of cells and organisms in the context of human medicine, molecular biology, microbiology, environmental science, industry and biotechnology. Biochemistry encompasses first and foremost the study of enzymes, which are proteins that catalyse chemical reactions. These enzymes form metabolic pathways through which molecular components are synthesised and transformed. The regulation and orchestration of bio-synthetic and bio-degradative pathways, the control of cellular reactions in response to environmental factors, cell division, cellular senescence, and programmed cell death (apoptosis) are all extensively studied topics. Furthermore, since all the information that determines form, growth, as well as distinct biological features, is contained in the DNA of a given species or the respective organisms, the molecular processes that enable duplication, repair, interpretation and modification of genetic material also form an integral part of the theoretical and practical studies in biochemistry.

It is worth noting that biochemical processes have the enormous advantage of taking place at room temperature and in aqueous solutions. Biochemical methods therefore often allow the production and synthesis of application-oriented molecules in both an elegant and environmentally safe manner. Given the great sensitivity of enzymes, their highly specific role and their power as catalysts, biochemical methods are playing an ever more important role in analytical techniques. The great leaps in progress achieved in pharmacology, medical diagnostics, preventive medicine (vaccination), food technology, agro-chemistry and environmental technology are thus due to a large extent to our understanding of the underlying biochemical processes.

Modern biology has become a trans-disciplinary science. The corresponding concepts derive from various disciplines, which not only include biochemistry, but also for instance developmental, evolutionary, and behavioral biology. As a result, biochemistry students are obliged to familiarise themselves with a variety of modern practical methods (e.g., optical and electronic microscopy, X-ray diffraction, mass spectrometry, and DNA sequencing) and with concepts of numerous disciplines. Moreover, life sciences benefit from of a flow of continuous technical innovation, which renders analytical tools increasingly sensitive and effective. The latest analytical instruments produce data at such speed and in such quantities that simply storing the information is becoming a problem. Bioinformatics tools provide a means of analysing large data set according to intelligent criteria. Modern biochemists have to familiarise themselves with these bioinformatics tools and learn how to put the large number of databases containing invaluable information to good use. Researchers no longer spend their time simply generating data, but also in analysing and comparing their own data with the ones from their peers.

Academic and professional openings
In a century which seems set to become a «century of nano-science and bioscience», trained biochemists face a vast array of career opportunities.

Ideally followed by a Master of Science in Molecular Life and Health Sciences, option Biochemistry and Cell Biology, this bachelor's degree prepares the future graduates for work in the area of research and technological development focusing on biology, biochemistry or nano-technology primarily within a variety of academic or entrepreneurial, private settings (e.g., agro-chemistry, pharmacology, or biotechnology). This degree therefore opens the doors to a career in either the public or private work environment, be it in in a laboratory, or in an administrative position dealing for instance with patents, environmental protection, health care, or agriculture.

Biochemists with a master's degree can continue to obtain a science doctorate in a university or specialised research institute. The professional openings for students who have successfully obtained their doctorate are similar, but with a higher degree of responsibility. For example, a Ph.D. followed by a post-doctorate training course is the ideal career path for a post as head of a

research unit or as a university professor.

Studies organisation

Structure of studies

120 ECTS credits + 60 ECTS credits in one or two minor study programmes freely chosen, 6 semesters

Curriculum

http://studies.unifr.ch/go/mjkY5 *(French)*
http://studies.unifr.ch/go/0fTFn *(German)*

Admission

The following **Swiss school-leaving certificates** grant **admission to bachelor programmes** at the University of Fribourg:

- Swiss academic Maturity Certificate
- Federal vocational or specialised Baccalaureate + supplementary examination of the Swiss Maturity Commission (passerelle)
- Bachelor Degree from a Swiss university, from an accredited Swiss university of applied sciences (HES/FH) or from a Swiss university of teacher education (HEP/PH)

A **complete list of all further recognised Swiss school-leaving certificates** is to be found on the webpages of swissuniversities (*in French and German only*): https://studies.unifr.ch/go/fr-admission-swisscertificates; https://studies.unifr.ch/go/de-admission-swisscertificates
Foreign upper secondary school-leaving certificates are recognised only if they correspond substantially to the Swiss Maturity Certificate. They must qualify as general education. Foreign school-leaving certificates are considered to be general education if, among other things, the last three years of schooling include at least six general education subjects, independent from each other, in accordance with the following list:

1. Language of instruction (at the school)
2. Second language (a foreign language)
3. Mathematics
4. Natural sciences (biology or chemistry or physics)
5. Humanities and social sciences (geography or history or economics/law)
6. Elective (computer sciences or philosophy or an additional language or an additional subject from category 4 or 5)

The general **admission** requirements to the **bachelor programmes** at the University of Fribourg for holders of foreign school-leaving certificates as well as the **admission requirements for individual countries** are to be found on the webpages of swissuniversities: https://studies.unifr.ch/go/en-admission-countries
In addition, applicants with foreign school-leaving certificates must present **proof of sufficient language skills in French or German**.
All guidelines are available at *(only in French and German)*: https://studies.unifr.ch/go/adm-guidelines

*The assessment of foreign school-leaving certificates is based on the «Recommendations for the Assessment of Foreign Upper Secondary School-Leaving Certificates» adopted by the Chamber of universities of swissuniversities on 21.11.2024 (*https://studies.unifr.ch/go/swissuniversities24fr*;* https://studies.unifr.ch/go/swissuniversities24de*). The admission requirements are valid for the respective academic year. The Rectorat of the University of Fribourg reserves the right to change these requirements at any time.*

Alternatives

Also offered as a minor study programme (60/30 ECTS credits).

Contact

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