Biochemistry

Degree conferred
Bachelor of Science in Biochemistry

Languages of study
Study in two languages, 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
programme Biology – Option: Biochemistry.

The Bachelor's 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 analyzing DNA and genetic information as an
integral part of the study program. The biochemistry course thus
gives students an opportunity to familiarize 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 catalyze chemical
reactions. These enzymes form metabolic pathways through which
molecular components are synthesized 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 familiarize 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 analyzing large
data set according to intelligent criteria. Modern biochemists have
to familiarize 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 analyzing 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 Biology (Option:
Biochemistry), 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 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 specialized 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.

http://studies.unifr.ch/enbachelor/sci/biochemistry
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/mjkYS (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
- Swiss vocational or specialised Baccalaureate in conjunction with the supplementary exam certificate from the Swiss Maturity Commission
- 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 recognized Swiss school-leaving certificates is to be found on the webpages of swissuniversities (in French and German only): http://studies.unifr.ch/go/en-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 the last three years of schooling include at least six general education subjects, independent from each other, in accordance with the following list:

1. First language (native language)
2. Second language
3. Mathematics
4. Natural sciences (biology, chemistry or physics)
5. Humanities and social sciences (geography, history or economics/law)
6. Elective (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: http://studies.unifr.ch/go/en-admission-country-list

In addition, foreign candidates must present proof of sufficient language skills in French or German.

The assessment of foreign school-leaving certificates is based on the «CRUS Recommendations for the Assessment of Foreign Upper Secondary School-Leaving Certificates, 7 September 2007» (http://studies.unifr.ch/go/crus07en). 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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