



Life Sciences and  
Facility Management

## Bachelor's degree in Chemistry

### Specialisations

Chemistry, Biological Chemistry | page 3

### Overview

Bachelor's degree in six semesters | page 5

### Prospects

Best labour market prospects | page 7

**Important information** | page 9

**At a glance** | page 11

# Chemistry

## Creative processes

Chemistry is concerned with the conversion of all kinds of raw materials into substances with new chemical, physical and biological properties for many new exciting applications.

As a chemist you are at the centre of this creative process and can contribute to designing the future. You develop new products, analysis methods and production processes, tap new raw materials or secure our energy supply. While responsible handling of resources and the environment is vital for these activities, enthusiasm for connecting theory and practice is also essential for chemistry students at a university of applied sciences.

## Study programme

Are you interested in scientific relationships? Do you enjoy experimenting? Do you want to get to grips with new problems and challenges in chemistry and biological chemistry? Then the degree programme in Chemistry is just the thing for you!

It provides broad technical knowledge in the natural sciences. Using mathematical, physical, chemical and biological models, the first step is to investigate how chemical processes work, and then to develop promising new substances and processes in the laboratory on the basis of what you have learnt. Within the degree program, you can choose the specialization in Chemistry or Biological Chemistry and additionally select one of seven minors.

Our Bachelor's degree programme in chemistry in Wädenswil has been awarded the "Chemistry Eurobachelor®" quality label.



## Structure

The programme spans six semesters of full-time study. The first two semesters, in which you obtain a solid foundation in general chemistry, biology, mathematics, physics and computer sciences are identical for both specializations.

From the 4<sup>th</sup> semester onwards, you can customize parts of your academic studies according to your prior knowledge, interests, and career goals. You can choose between the specializations of **Chemistry** and **Biological Chemistry**, and you can expand your skills selectively through seven interdisciplinary minors. The program concludes with a bachelor's thesis. Project-oriented work, often in collaboration with the industry, is central to the curriculum.

During the entire study programme, you are trained to enhance your communication skills, as well as your ability to work independently and as part of a team. Furthermore, the modular structure enables you to spend a semester studying abroad and take part in student exchanges with other universities.

The study programme can also be completed on a part-time basis.

# Specialisations

## Chemistry

The classic discipline of chemistry has lost none of its fascination and is now more in demand than ever: areas of application range from pharmaceutical and cosmetic active ingredients, plastics and renewable raw materials to the energy sources and fuels of the future.

### Areas of focus

- Industrial chemistry
- Organic chemistry
- Physical chemistry
- Chemical engineering

### Areas of activity

- Research and development in the fields of syntheses, materials and processes, active ingredients, research and development
- Development of methods and implementation of analyses
- Set-up and application of measurement and sensor technology
- Project, operation and production management
- Design and implementation of process and environmental technology
- Process control, quality assurance and quality management
- Operational safety, risk analysis and risk management
- Technical purchasing and sales
- Consulting and training for employees and customers

## Biological Chemistry

The young discipline of biological chemistry uses an interdisciplinary approach to enhance understanding of the mysteries of life and to enable this understanding to be turned to practical use. It involves investigation of the chemical processes in living organisms. This requires additional theoretical and practical knowledge of biochemistry, micro and cell biology, biochemical engineering and molecular genetics. Career opportunities can especially be found in the life sciences industry, where the detection of correlations at the interface of chemistry and biology has a high priority.

### Areas of focus

- Biochemistry
- Microbiology
- Cell biology
- Bioengineering

### Areas of activity

- Research and development in the fields of pharmaceuticals, materials and processes.
- Development of methods and implementation of bioanalyses
- Development and production of cell and tissue material
- Production of chemicals using biological methods
- Project, operation and production management
- Process control, quality assurance and quality management
- Operational safety, risk analysis and risk management
- Technical purchasing and sales
- Consulting and training for employees and customers

# Minors

Thanks to seven interdisciplinary minors, you can give your studies an individual profile in the fifth semester. One minor is mandatory, and if desired, a second minor can be chosen. Each minor corresponds to 12 ECTS credits, with half of the credits earned through an internship.

The minor internships are carried out in teams of two, where mixed groups from different study programs are highly encouraged. In the minor "Pharmaceutical Technology", a structured internship is completed, where relevant technologies are taught through practical training.

## Bioanalytics and Diagnostics

The minor covers three thematic areas:

- Protein analysis focuses on pure preparations outside the cellular matrix, with a particular emphasis on biopharmaceuticals within the regulatory environment.
- Cell-based bioanalytics involves the analysis of macromolecules, cell structures, metabolism, as well as tissues and organs.
- Biomedical analytics deals with the most common pathophysiologicals in Europe and their diagnostic methods (including artificial intelligence).

## Biotechnology and Food Chemistry

The minor covers emerging fields of food science. It comprises three courses:

- Key ingredients in food and their analysis
- Innovative product developments (e.g. single-cell protein, starter cultures, clean meat)
- The Science of Coffee Along the Value Chain

The graduates can apply their knowledge in chemistry and biotechnology to the field of food and confidently address important everyday topics.

## Cell and Tissue Therapy\*

Cell and tissue therapies are a rapidly growing segment of regenerative medicine. This minor provides expertise in therapeutic indications, approved products in the market including their manufacturing and approval processes, as well as economic and ethical aspects. It prepares students for roles in the development and production of cell and tissue therapeutics.

\*Prerequisites are defined for chemistry students.

## Digital methods in Life Sciences

Digital, computer-based methods are at the forefront of the life sciences. With the help of informatics, models for chemical or biotechnological inquiries are developed and numerically processed. Programming skills in a simple, object-oriented language are taught and applied. To extract scientific insights from large datasets, you will learn to employ statistical methods and utilize cutting-edge approaches like "Machine Learning."

## Medicinal Chemistry and Active Compounds

There is an increasing demand for pharmacological compounds to treat diseases such as cancer or viral infections. Drug development is a complex interdisciplinary process that requires competencies in organic synthesis, medicinal chemistry, pharmaceutical sciences, as well as molecular, microbiological, and cellular biology. The minor focuses on highlighting the interplay between these disciplines. It also addresses the issue of drug resistance and explores rational approaches to overcome it.

## Pharmaceutical Technology

In order for a drug to exert its therapeutic effect, it needs to be formulated into a suitable form with the help of excipients. The minor covers the technical manufacturing and development of various dosage forms, provides an introduction to nanotechnology-based drug delivery systems, teaches the fundamentals of cleanroom technology, offers an overview of quality assurance, and imparts in-depth knowledge in the field of pharmaceutical microbiology.

## Environmental Chemistry and Biotechnology

Chemistry and biotechnology play a vital role in addressing pressing environmental issues such as climate change and resource scarcity. In the minor, you will learn about the biochemical processes and ecological principles of nature and how we can harness them to meet societal needs through innovative approaches. The focus is on three objectives: the use of new bio-based products, the production of renewable energy, and the closing of material cycles to enable resource- and energy-efficient production and consumption.

# Overview

		1 <sup>st</sup> year of study	2 <sup>nd</sup> year of study	3 <sup>rd</sup> year of study
Lectures	Basic and specialized studies	General Chemistry Analytical Chemistry Organic Chemistry  Biology Microbiology  Mathematics Physics Computer Science Digital Literacy  English Social Context & Language	Analytical Chemistry Inorganic Chemistry Bioinorganic Chemistry Biochemistry Organic Chemistry Physical Chemistry  Cell Biology  Chemoinformatics Mathematics  Chemical Processes Biological Processes Modeling & Simulation English	Biochemistry Organic Chemistry Physical Chemistry  Quality Management  Chemical Processes Ecology & Raw Materials Measurement and Control Engineering  Communication and Presentation Personnel Management
	Specialization in Chemistry		Industrial Chemistry (Process Development)	Industrial Chemistry (Polymer Chemistry) Physical Chemistry
	Specialization in Biological Chemistry		Advanced Biochemistry	Biochemical Engineering
Minors				Bioanalytical and Diagnostics* Biotechnology and Food Chemistry* Digital Methods in Life Sciences* Medicinal Chemistry and Active Compounds* Pharmaceutical Technology* Environmental Chemistry and Biotechnology* Cell and Tissue Therapy*
Internships		General Chemistry Analytical Chemistry	Analytical Chemistry Organic Chemistry Microbiology and Cell Biology Biological and Chemical Processes  Biochemistry <sup>BC</sup> Organic Chemistry <sup>CH</sup>	Bioprocess Engineering <sup>BC</sup> Industrial Chemistry <sup>CH</sup>  Minor Internship
assignments				<b>Bachelor's Thesis</b> Preliminary and Main Project

BC: Specialization in Biological Chemistry  
CH: Specialization in Chemistry

\*1 elective



## Chemistry student

“The versatility of my studies at the ZHAW allows me to combine my passion for model making and electronics with chemistry.

With my flying environmental laboratory, which I developed for my Bachelor's thesis, I can track down environmental offenders and gas leaks, even in inaccessible areas.”

# Alexander

# Prospects

## Educational objectives

The study programme provides a broad education in chemistry, biology and chemical engineering, with mathematics and physics as foundations, which enables you to react flexibly to a rapidly changing professional environment.

The two specializations allow for specialization without losing sight of the overarching goal of a comprehensive education in chemistry. With one of the seven interdisciplinary minors covering various application areas, you can further sharpen your profile.

The inclusion of biological chemistry in the study programme extends the variety of career paths available to you on graduation. You practise implementing the concepts acquired in lectures through tasks in the laboratory in step with actual practice. In addition, you learn to study independently to cope with new areas of work through the individual self-study component. In the final year, your knowledge and skills are deepened through participation in applied research and development projects.

## Career prospects

Chemistry graduates from a university of applied sciences are particularly sought after by private and public enterprises and government departments because of the practical orientation of the degree programme. In large companies, they tend to work in specialized fields, while in small and medium-sized enterprises they often assume broad responsibilities in technological positions, leadership and management. Working in big companies also opens up a wide range of opportunities.

### Industry and manufacturing

- Fine and speciality chemicals
- Agricultural, construction and cleaning chemicals
- Plastics, textile, paint and coating chemicals
- Manufacturers of cosmetics, fragrances and flavours
- Food chemistry
- Pharmaceutical industry
- Biotechnology
- Nanotechnology

### Research and development

- Universities and research institutes
- Chemical or related industries
- Manufacturers of analytical instruments and chemical and biotechnological equipment

### Consulting, cantonal and federal agencies

- Analytical laboratories
- Energy, environmental and engineering offices
- Hospitals
- Public administration

## Master's degree programme / Continuing education

After successfully completing your Bachelor's degree at the ZHAW in Wädenswil, you can opt for the research-based and practically-oriented Master of Science in Life Sciences degree with the specialisation “Chemistry for the Life Sciences”. A Master's degree enhances your career opportunities, particularly in international companies.

[www.zhaw.ch/icbt/master-chemistry](http://www.zhaw.ch/icbt/master-chemistry)

With an excellent bachelor's degree, you can continue your studies (MSc, PhD) at a university or ETH in Switzerland or abroad.

You can also attend practice-related continuing education courses or study programmes (MAS, DAS, CAS) at a university of applied sciences or traditional university. Participation in conferences, for example those taking place at the Institute of Chemistry and Biological Chemistry, equips you with new knowledge and fosters professional networking.

[www.zhaw.ch/icbt/weiterbildung](http://www.zhaw.ch/icbt/weiterbildung)

# Important information

## Conditions for acceptance

The study programme is multidisciplinary and taught in German\*. Students come from a broad variety of educational backgrounds.

- Candidates with a vocational baccalaureate (Berufsmaturität) and related vocational training can begin their studies directly:
  - Laboratory technician with a state-recognised qualification (EFZ) in one of the following fields:
    - chemistry
    - biology
    - paints and coatings
    - physics
    - textiles
  - Chemical and pharma technologist with a state-recognised qualification (EFZ)
- Candidates trained as biomedical analysts can also start their studies directly.
- Candidates with a vocational baccalaureate (Berufsmaturität) and an apprenticeship in an unrelated profession are required to have work experience in a profession related to their field of study. General professional experience is taken into account so that, depending on the apprenticeship, a 6 to 12 months' work experience must still be completed.
- Individuals with a high school diploma or a specialized vocational diploma (FMS) require professional experience in the field of study in the form of a one-year work experience. High school graduates can also directly enter the practice-integrated study model (PIBS) immediately after completing their high school diploma (Matura). This study program lasts for 4 years and is linked to an internship agreement with a company.

The recognition of work experience or internships completed is granted by the programme director 'sur dossier'. For information on additional admission options and for special cases (e.g. foreign qualifications), please contact the programme director.

## Support from the ZHAW

If you do not have the relevant work experience, you can take a laboratory introduction course here at the ZHAW. This prepares you for the internship in industry which you need for admission to the Chemistry degree programme. The introductory internship, which transfers important laboratory skills and techniques, lasts two months and starts at the end of July.

Other ways of preparing for the Bachelor's degree programme, such as preparatory courses, e-learning for mathematics, literature etc. can be found at:

[www.zhaw.ch/lisfm/preliminary-courses](http://www.zhaw.ch/lisfm/preliminary-courses)

## Dates

The study programme begins mid-September. The registration deadline is 30 April.

## International exchange

Would you like to do part of your chemistry studies abroad? The ZHAW provides this valuable opportunity. An exchange semester, a foreign internship, attendance at a summer school, a field trip or a language course all bring many advantages: you get to know a different culture and language as well as another educational and research system, and gain experience for your professional life.

Chemistry students, for example, can participate in a bilateral exchange programme at the Worcester Polytechnic Institute (WPI) in the USA or University College Cork (UCC) in Ireland. Moreover, students at the School of Life Sciences and Facility Management have the opportunity to take part in an exchange semester at partner universities through the Swiss European Mobility Programme (SEMP). Our specialist academic counsellors and the staff of the International Relations Office at the ZHAW (IRO) will be pleased to provide individual consultation without obligation. For more information on international student online registration for an exchange semester, and reports of students' experiences, see:

[www.zhaw.ch/lisfm/international/en](http://www.zhaw.ch/lisfm/international/en)

## Chemistry student

"Studying chemistry is exactly the right way to find my dream job, because it combines my enthusiasm for natural sciences with the best professional perspectives. I find my research work on new biomolecules, which are used as therapeutics in medicine, particularly exciting.

In Switzerland in particular, this new class of active ingredients is being used in state-of-the-art equipment."

# Raffaella

# At a glance

<b>Degree programme Specialisations</b>	Chemistry Chemistry, Biological Chemistry
<b>Title</b>	Bachelor of Science ZHAW in Chemistry
<b>Duration</b>	Full-time (six semesters), part-time (individually planned). Part-time studies are integrated into full-time studies and last 4 to 6 years depending on individual workloads.
<b>Start of studies</b>	Mid-September (week 38); one week earlier for all new 1 <sup>st</sup> semester students (week 37)
<b>Workload</b>	180 ECTS credits (1 credit represents 25 to 30 hours of work).
<b>Preparation</b>	Preparatory courses in mathematics, chemistry, physics, biology, and computer literacy, as well as an introductory laboratory internship; Details at: <a href="http://www.zhaw.ch/en/lsfm/study">www.zhaw.ch/en/lsfm/study</a>
<b>Campus</b>	Wädenswil on Lake Zurich (25 km from Zurich)
<b>Tuition fees</b>	Semester fees: CHF 720 (subject to change) plus study materials, membership of the ASVZ sports association and individual living expenses. An additional fee of CHF 500 per semester is also applicable for all students who travel to Switzerland for study purposes and do not have permanent Swiss residence when commencing their studies.
<b>Conditions of acceptance</b>	Candidates with a vocational apprenticeship (relating to chemistry) and a federally recognised vocational baccalaureate can begin their studies directly. Candidates with a federal certificate of proficiency in another professional field other than chemistry require 6 to 12 months' work experience. Candidates with an academic baccalaureate, a technical baccalaureate or a higher education diploma must prove 12 months' work experience in a field related to chemistry before beginning their studies. Alternatively, candidates with an academic baccalaureate have the option of starting their studies with a four-year, practice-integrated Bachelor's programme via PIBS (Practice-Integrated Bachelor's programme). We will be happy to advise you.
<b>Important information</b>	Seven interdisciplinary minors. Excellent student-to-faculty ratio. Dedicated instructors. State-of-the-art laboratories and equipment. Study abroad semesters or internships abroad. Laboratory internships with creative solutions for real-world problems. Direct application of theory to practice. Bachelor's thesis in applied research and development.
<b>Information events</b>	Two times per year, in spring and autumn. Details at: <a href="http://www.zhaw.ch/lsfm/infoveranstaltungen">www.zhaw.ch/lsfm/infoveranstaltungen</a>
<b>Study advisor</b>	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">               Achim Ecker  <a href="mailto:studienberatung-ch.lsfm@zhaw.ch">studienberatung-ch.lsfm@zhaw.ch</a> </div> <div style="text-align: center;">               Claudia Weller  <a href="mailto:studienberatung-ch.lsfm@zhaw.ch">studienberatung-ch.lsfm@zhaw.ch</a> </div> </div>

After studying chemistry here in Wädenswil, you will be ideally equipped and sought after for positions of responsibility.

# Study and research in Wädenswil: practically-oriented, creative, passionate and reflectiv

The ZHAW is one of the leading Swiss universities of applied sciences. The School of Life Sciences and Facility Management currently has around 1800 students and employs more than 600 people. The educational programme comprises Bachelor's and Master's degree programmes as well as a broad range of further training and education courses.

Our expertise in life sciences and facility management in the areas of the environment, food and health enables us to make a vital contribution to solving social challenges and improving quality of life. Our success is based on dynamic institutes with extensive competence in research, development and services in the disciplines of applied computational life sciences, biotechnology, chemistry, food and beverage innovation, natural resource sciences and real estate & facility management.



**Environment | Food | Health | Society**  
Our competences in Life Sciences  
and Facility Management.

ZHAW Campus Reibbach / Einsiedlerstrasse

ZHAW Campus Reibbach / Seestrasse

Wohnhaus für Studierende

ZHAW Campus Gruental

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