Module Catalogue
for the Subject
Biochemistry
as a Bachelor’s with 1 major
with the degree "Bachelor of Science"
(180 ECTS credits)

Examination regulations version: 2015
Responsible: Faculty of Medicine
Responsible: Faculty of Chemistry and Pharmacy
Contents

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Content and Objectives of the Programme

The Biochemistry Bachelor study program of the Julius-Maximilians-University of Wuerzburg is offered by the Faculty of Chemistry and Pharmacy and the Faculty of Medicine as a basic study course with the degree "Bachelor of Science" (B.Sc.) (180 ECTS credits) as part of a consecutive Bachelor’s and Master’s study program.

After successful completion of the Bachelor’s studies, students possess the following skills:

- Proficiency in the basic sciences, in particular general, inorganic, organic and physical chemistry, molecular and cellular biology, mathematics, physics, and bioinformatics;
- Solid knowledge and practical skills in the experimental techniques of biochemistry, bioanalytics, molecular biology and structural biology;
- The ability to handle (under guidance, but considerably autonomous) a biochemical problem that is narrowly defined in terms of subject matter and time, by applying the acquired methods under scientific-analytical procedures, and to analyze, summarize and subsequently present the data obtained to a specialist audience.
Abbreviations used

Course types: **E** = field trip, **K** = colloquium, **O** = conversatorium, **P** = placement/lab course, **R** = project, **S** = seminar, **T** = tutorial, **Ü** = exercise, **V** = lecture

**Term:** **SS** = summer semester, **WS** = winter semester

**Methods of grading:** **NUM** = numerical grade, **B/NB** = (not) successfully completed

**Regulations:** (L)ASPO = general academic and examination regulations (for teaching-degree programmes), **FSB** = subject-specific provisions, **SFB** = list of modules

**Other:** **A** = thesis, **LV** = course(s), **PL** = assessment(s), **TN** = participants, **VL** = prerequisite(s)

Conventions

Unless otherwise stated, courses and assessments will be held in German, assessments will be offered every semester and modules are not creditable for bonus.

Notes

Should there be the option to choose between several methods of assessment, the lecturer will agree with the module coordinator on the method of assessment to be used in the current semester by two weeks after the start of the course at the latest and will communicate this in the customary manner.

Should the module comprise more than one graded assessment, all assessments will be equally weighted, unless otherwise stated below.

Should the assessment comprise several individual assessments, successful completion of the module will require successful completion of all individual assessments.

In accordance with

the general regulations governing the degree subject described in this module catalogue:

ASPO2015

associated official publications (FSB (subject-specific provisions)/SFB (list of modules)):

22-Jul-2015 (2015-42)

20-Apr-2017 (2017-28)

This module handbook seeks to render, as accurately as possible, the data that is of statutory relevance according to the examination regulations of the degree subject. However, only the FSB (subject-specific provisions) and SFB (list of modules) in their officially published versions shall be legally binding. In the case of doubt, the provisions on, in particular, module assessments specified in the FSB/SFB shall prevail.
Compulsory Courses

(115 ECTS credits)
Module title | Abbreviation
---|---
Structural Biology | 03-5S2ST-BC-152-m01

Module coordinator | Module offered by
holder of the Chair of Structural Biology | Faculty of Medicine

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
10 | numerical grade | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | undergraduate | --

Contents

This module provides a brief introduction to crystallography and commonly used biophysical techniques as well as the fundamental principles of macromolecular architectures. Building on this, the structure and function of selected biological macromolecules are presented. In small groups, participants will analyse one specific macromolecule in silico with respect to its structure and biological function and will present their results in a talk. The various macromolecules in their entirety reflect a number of important biological problems.

Intended learning outcomes

On the basis of individually assigned model proteins, the students will acquire the ability to explore common problems in structural biology and to analyse structure-function relationships. They will also acquire skills in the oral presentation of scientific results as well as in the in silico analysis of biological macromolecules.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (6)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 minutes)
Language of assessment: German and/or English

Allocation of places
--

Additional information
--

Referred to in LPO I (examination regulations for teaching-degree programmes)
--
**Module title**
General Biology for Biochemistry Students

**Abbreviation**
07-1A1ZO-BC-152-m01

**Module coordinator**
Dean of Studies Biologie (Biology)

**Module offered by**
Faculty of Biology

**ECTS**
5

**Method of grading**
numerical grade

**Duration**
1 semester

**Module level**
undergraduate

**Other prerequisites**
--

**Contents**
The first part of the course will acquaint students with the elementary building blocks of life as well as biological categories. Building on this knowledge, the course will then discuss the cell, the smallest unit of life, starting with its macroscopic structure before moving on to its microscopic structure. The course will point out differences and similarities between prokaryotic cells (bacteria, archaeabacteria) and eukaryotic cells (animals, plants). The second part will address one of the central issues of biology: evolution. Fundamental mechanisms and hypotheses will be discussed and students will be introduced to major phylogenetic reconstruction methods. Using the examples of plants and animals, the subsequent module components will introduce students to the phylogenetic diversity of eukaryotes. At the level of groups in the plant and animal kingdoms, students will acquire the fundamental knowledge necessary to understand the forms and functions of animal and plant organisms, with morphology and cytology being discussed in an evolutionary and ecological context. The contents of the module are relevant for biological disciplines at all levels of biological organisation. Students will also acquire and practise some of the fundamental preparation skills bioscientists are often required to possess.

**Intended learning outcomes**
Knowledge of the structures of prokaryotic and eukaryotic cells and their (biological) macromolecules. Knowledge of the specific characteristics of the intracellular and extracellular structures of prokaryotes as well as animal and plant cells. Ability to recognise evolution as the driving force behind the phylogeny of species. Familiarity with the concepts of phylogenetic relationships between plants/animals. Familiarity with the distinguishing characteristics and major representatives of groups in the plant and animal kingdoms. Ability to select those plant and animal organisms that are most suitable for particular scientific issues. Familiarity with the components and functioning of microscopes. Fundamental skills in the interpretation of macroscopic and histologic preparations by light microscopy. Fundamental preparation skills.

**Courses** (type, number of weekly contact hours, language — if other than German)
V (5)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
written examination (approx. 180 minutes)

**Allocation of places**
--

**Additional information**
--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)
--
Module title: Principles of Inorganic Chemistry  
Abbreviation: 08-AC1-152-m01

Module coordinator: lecturer of lecture "Experimentalchemie" (Experimental Chemistry)  
Module offered by: Institute of Inorganic Chemistry

ECTS: 8  
Duration: 1 semester  
Module level: undergraduate  
Other prerequisites: --

Contents:
The module provides an overview of the fundamental knowledge of chemistry. Emphasis is placed on the material and particle level, metals, acid-base reactions, the periodic table, chemical equilibrium and complexometry. In addition, the module introduces fundamental concepts of chemistry and teaches the basics of inorganic chemistry.

Intended learning outcomes:
The student understands the principles of the periodic table and can obtain information from it. He/she is proficient in basic models of the structure of matter and can describe them properly. He/she can depict chemical reactions using typical chemical formula language and interpret them by identifying the type of reaction. The students know how the most important quantitative and qualitative analytical methods work and their areas of application.

Courses: (type, number of weekly contact hours, language — if other than German)  
V (4) + V (2)

Method of assessment: (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)  
a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (20 to 30 minutes) or c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes)

Language of assessment: German and/or English

Additional information: --

Referred to in LPO I (examination regulations for teaching-degree programmes)  
§ 42 I Nr. 1 and § 22 II Nr. 1 h)  
§ 62 I Nr. 1
Module title | Abbreviation
---|---
Inorganic Chemistry 1 (lab) for Biochemistry students | 08-ACP1-BC-152-m01

Module coordinator | Module offered by
holder of the Chair of Anorganic Chemistry | Institute of Inorganic Chemistry

ECTS | Method of grading | Other prerequisites
6 | Only after succ. compl. of module(s) | --

Duration | Module level | Other prerequisites
1 semester | undergraduate | --

Contents
The module provides the opportunity to apply the knowledge of the introductory lectures in a practical course. After a safety introduction the students experiment independently in the laboratory. Focuses are laboratory safety, basic laboratory techniques, synthesis of basic compounds and analysis of an unknown compound.

Intended learning outcomes
The student is able to identify basic chemical issues and to solve them experimentally. Therefore he/she can carry out the necessary stoichiometric calculations and correctly outline the chemical processes written and verbal.

Courses (type, number of weekly contact hours, language — if other than German)
P (6) + S (2)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
A) assessment [a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (20 to 30 minutes) or c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes)] as well as B) Vortestate/Nachtestate (pre and post-experiment examination talks approx. 15 minutes each, log approx. 5 to 10 pages each) and assessment of practical assignments (2 to 4 random examinations)
Assessment offered: Once a year, winter semester
Language of assessment: German and/or English

Allocation of places
--

Additional information
--

Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title
Organic Chemistry 1

Abbreviation
08-OC1-152-m01

Module coordinator
holder of the Professorship of Organic Chemistry

Module offered by
Institute of Organic Chemistry

ECTS
5

Method of grading
numerical grade

Only after succ. compl. of module(s)
--

Duration
1 semester

Module level
undergraduate

Other prerequisites
--

Contents
This module provides students with an overview of the fundamental principles of organic chemistry. It examines the bonding situation of carbon and introduces students to the nomenclature of simple and moderately complex organic compounds. The module also discusses the fundamental principles of stereochemistry, substitution, addition and elimination reactions as well as synthesis planning.

Intended learning outcomes
Students know important categories of substances in organic chemistry. They are able to use different systems of nomenclature to determine simple substance names. Students are able to analyse the stereochemistry of molecules. They are able to describe and formulate some of the most important reactions in organic chemistry. For that purpose, they can analyse and categorise the characteristic reaction conditions and can use them for simple syntheses.

Courses
V (3) + Ü (1)

Method of assessment
a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (20 to 30 minutes) or c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I
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<td>holder of the Chair of Physically Organic Chemistry</td>
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**Contents**

This module introduces students to the rules of aromaticity and discusses specific reactions of aromatics. Using the example of carbonyl compounds, it extends the students’ knowledge of substitution, elimination and addition reactions to complex reaction mechanisms. The course also focuses on oxidation and reduction reactions as well as rearrangement. In addition, it introduces students to the spectroscopic methods of infrared spectroscopy, mass spectrometry and NMR spectroscopy.

**Intended learning outcomes**

Students have become familiar with the criteria for aromaticity. They can analyse the varying reactivity of carbonyl compounds. They are able to describe specific reactions of carbonyls and aromatics. For that purpose, they can plan and formulate multi-stage syntheses with complex reaction mechanisms and can transfer them to unknown reactions. Students are able to describe important spectroscopic methods, to evaluate a spectrum and to draw conclusions regarding the molecular structure.

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**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (20 to 30 minutes) or c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Module Catalogue for the Subject Biochemistry

**Bachelor's with 1 major, 180 ECTS credits**

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**Contents**

This module gives students the opportunity to apply in practice the knowledge they have gained through the related lecture(s). After a safety briefing, the students autonomously conduct experiments in the laboratory. In addition to those experiments, students will be expected to take oral tests and write lab reports to demonstrate their knowledge. The course focuses on the safe handling of hazardous substances, simple experimental unit operations of organic chemistry, simple to multi-level syntheses and the analysis of the products.

**Intended learning outcomes**

Students know how to safely handle hazardous substances. They are able to conduct simple experimental operations of organic chemistry. They are able to analyse the yield and purity of the products and identify possible error sources. They are able to connect the theoretical aspects covered in the lecture with practical experiments in the laboratory.

**Courses** (type, number of weekly contact hours, language — if other than German)

- P (12)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- Vortestate/Nachtestate (pre and post-experiment examination talks approx. 15 minutes each, log approx. 5 to 10 pages each) and assessment of practical performance (2 to 4 random examinations)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<td>Molecular structure and spectroscopy</td>
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**Contents**

The module provides an introduction to the fundamental basics of molecular structure, spectroscopy and quantum mechanics. Via the particle in a box model and a quantum mechanical view of the hydrogen atom one gets to atomic orbitals, molecular orbitals and a basic understanding of the chemical bond. Molecules are analyzed based on the harmonic oscillator and the rigid rotor models. Spectroscopical focuses are UV/Vis spectroscopy, vibrational spectroscopy and rotational spectroscopy.

**Intended learning outcomes**

The student is able to explain basic models of quantum mechanics and to apply them on molecules. He/She can outline different spectroscopical methods.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (20 to 30 minutes) or c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes)

Language of assessment: German and/or English creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

§ 62 I Nr. 1
**Module title**  
Thermodynamics, Kinetics, Electrochemistry

**Abbreviation**  
08-PC-TKE-152-m01

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<td>Institute of Physical and Theoretical Chemistry</td>
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**Contents**

This module introduces students to the principles of thermodynamics. It focuses on the laws of thermodynamics, chemical equilibria, ideal and real gasses/solutions/mixed phases and electrochemistry. In addition to thermodynamic processes, it discusses the fundamental principles of kinetics.

**Intended learning outcomes**

Students are able to explain the laws of thermodynamics. They are able to describe thermodynamic aspects of solutions, gases, mixed phases and electrochemical reactions. Students are able to interpret the kinetic aspects of chemical reactions.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (4) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (20 to 30 minutes) or c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes)

Language of assessment: German and/or English creditable for bonus

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<tr>
<td>lecturer of lecture &quot;Thermodynamik, Kinetik, Elektrochemie&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
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</table>

**Contents**

This module gives students the opportunity to apply in practice the knowledge they have gained through the related lecture(s). After a safety briefing, the students autonomously conduct experiments in the laboratory. In addition to those experiments, students will be expected to take oral tests and write lab reports to demonstrate their knowledge.

**Intended learning outcomes**

Students are able to connect the theoretical principles of thermodynamics, kinetics, electrochemistry and spectroscopy with practical laboratory experiments. They are able to analyse the resulting measurements.

**Courses** (type, number of weekly contact hours, language — if other than German)

| P (4) |

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Vortestate/Nachtestate (pre and post-experiment examination talks approx. 15 minutes each, log approx. 5 to 10 pages each) and assessment of practical performance (2 to 4 random examinations)

Assessment offered: Once a year, winter semester

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
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<th>Abbreviation</th>
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<tr>
<td>Bioanalytics</td>
<td>08-BAN-152-m01</td>
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<tr>
<td>holder of the Chair of Biochemistry</td>
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</table>

**Contents**

The module imparts the theoretical and practical fundamentals of bioanalysis by lectures and both theoretical and practical exercises.

**Intended learning outcomes**

After attending the module events the student has basic knowledge of bioanalysis and is able to apply the contents in practical experiments.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (1) + Ü (1) + P (5)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or b) log (10 to 20 pages) or c) oral examination of one candidate each (20 to 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 to 20 minutes per candidate) or e) presentation (20 to 30 minutes) or f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
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<tr>
<td>Biochemistry 1</td>
<td>08-BC1-152-m01</td>
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### Contents

The module imparts the basic knowledge of biochemistry by lectures and tutorials. Main topics of the module Biochemistry 1 are particularly the biochemistry of proteins (amino acids, peptide bond, primary, secondary, tertiary and quaternary structure), catalytic strategies and enzyme kinetics, carbohydrate metabolism (glycolysis, gluconeogenesis, citric acid cycle, cellular respiration, photosynthesis), fatty acid metabolism (beta-oxidation, fatty acid synthesis), nucleotide metabolism, urea cycle and metabolism of amino acids. Additionally the module conveys basic knowledge about the structure of DNA and the basics of passing and transformation of genetic information (central dogma).

### Intended learning outcomes

The student has basic knowledge in the covered subject areas of biochemistry. He/She is able to describe the basic biochemical processes in cellular systems.

### Courses

<table>
<thead>
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### Method of assessment

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<tr>
<td>written examination (approx. 60 to 90 minutes)</td>
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### Allocation of places

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### Additional information

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### Referred to in LPO 1 (examination regulations for teaching-degree programmes)

§ 42 I Nr. 2
§ 62 I Nr. 2
<table>
<thead>
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<td>Biochemistry 2</td>
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### Contents

The module imparts the basic knowledge of biochemistry by lectures and in-depth tutorials. Main topics of the module Biochemistry 2 are particularly Replication, DNA repair, transcription, mRNA maturation, translation and regulation of translation, protein targeting, nuclear transport, and protein degradation. Additionally, the module conveys basic knowledge about the cellular signal transduction.

### Intended learning outcomes

The student has basic knowledge in the covered subject areas of biochemistry. He/She is able to describe the basic biochemical processes in cellular systems.

### Courses

(V (2) + Ü (1))

### Method of assessment

written examination (approx. 60 to 90 minutes)

### Allocation of places

--

### Additional information

Pursuant to Section 2 Subsection 2 Sentence 2 Verordnung über die Ausbildung und Prüfung der Staatlich geprüften Lebensmittelchemikerinnen und Lebensmittelchemiker (Regulation on the training and examination of state-certified food chemists, APOLmCh) in conjunction with No. II 2. Letter e) and No. II 1. Letter c) of Annex 1 of APOLmCh and No. 3 of Annex 3 of APOLmCh.

Referred to in LPO I (examination regulations for teaching-degree programmes)

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**Contents**

In this module the basics of scientific biochemical experimentation shall be practiced in practical exercises.

**Intended learning outcomes**

After participating in the practical exercises the students master basic biochemical methods and are able to purposefully apply them.

**Courses** (type, number of weekly contact hours, language — if other than German)

| P (6) |

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Log (approx. 30 pages)

Assessment offered: Once a year, summer semester

**Allocation of places**

Students of the Bachelor's degree programme Biochemie (Biochemistry, 180 ECTS credits): no restrictions with regard to available places.

Students of the Bachelor's degree programme Chemie (Chemistry, 180 ECTS credits): no more than 6 places; places will be allocated according to the number of subject semesters, among applicants with the same number of subject semesters, places will be allocated by lot; a waiting list will be maintained and places re-allocated by lot as they become available.

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
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<td>Molecular Biology</td>
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</table>

**Contents**

The module covers specific topics of molecular physiology and functional biochemistry in lectures and exercises. An additional lecture conveys the subject field of genetic engineering and biosafety.

**Intended learning outcomes**

After attending the module events, students have sound knowledge in molecular biology. The students know the necessary infrastructure and usage rules for the different security levels of genetic engineering facilities. They have mastered the basics of genetic engineering in theory and are able to describe relevant examples of the use of gene technology and to explain the associated safety issues.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V (2) + Ü (1) + V (1)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or b) log (10 to 20 pages) or c) oral examination of one candidate each (20 to 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 to 20 minutes per candidate) or e) presentation (20 to 30 minutes) or f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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<table>
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<td>Mathematics for students in Chemistry and Biology</td>
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**Module coordinator**

Dean of Studies Mathematik (Mathematics)

**Module offered by**

Institute of Mathematics

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</table>

**Contents**

Functional relations, differentiation and integration of functions in one variable, curve sketching, differentiation of functions in several variables, power series, ordinary differential equations, systems of linear equations, basic notions in statistics.

**Intended learning outcomes**

The student is able to recognise and phrase simple questions from natural sciences as mathematical problems, apply basic mathematical methods to them and interpret the results.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V (3) + Ü (2)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 90 to 120 minutes) and written exercises (approx. 25)

**Allocation of places**

--

**Additional information**

Pursuant to Section 2 Subsection 2 Sentence 2 Verordnung über die Ausbildung und Prüfung der Staatlich geprüften Lebensmittelchemikerinnen und Lebensmittelchemiker (Regulation on the training and examination of state-certified food chemists, APOlmCh) in conjunction with No. I 2. Letter f) of Annex 1 of APOlmCh.

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<td>Introduction to Physics for Students of other Disciplines</td>
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<td>Managing Director of the Institute of Applied Physics</td>
<td>Faculty of Physics and Astronomy</td>
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<td>Contents</td>
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<tr>
<td>Mechanics, vibration theory, thermodynamics, optics, science of electricity, Atomic and Nuclear Physics.</td>
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<td>Intended learning outcomes</td>
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<td>The students have knowledge of the principles of Physics.</td>
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<tr>
<td>Laboratory Course Physics for Students of other Disciplines</td>
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**Module coordinator**
Managing Director of the Institute of Applied Physics

**ECTS**

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**Duration**
1 semester

**Module level**
undergraduate

**Other prerequisites**
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**Contents**
Simple experiments in the fields of mechanics, vibration theory, thermodynamics, optics, X-rays, nuclear magnetic resonance, Atomic and Nuclear Physics, imaging methods.

**Intended learning outcomes**
The students have detected and understood physical contexts on the basis of the implementation of own experiments. They have a basic understanding of physical phenomena and know the basic ideas and ways of functioning of different measuring and imaging methods as well as their applications, especially in the field of Biomedicine.

**Courses**
(type, number of weekly contact hours, language — if other than German)

| P (4) |

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) practical assignment with oral test (approx. 15 minutes, during experiments) and b) written examination (90 minutes).

Each experiment comprises preparation, performance and evaluation. Test as well as performance of experiments can each be repeated once.

**Allocation of places**
Only as part of pool of general transferable skills (ASQ): 10 places (lottery)

**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)

--
Compulsory Electives

(30 ECTS credits)
Module title | Abbreviation
---|---
Immunology for biochemistry students | 03:4S1/MM-BC-152-m01

Module coordinator | Module offered by
holder of the Professorship of Immunogenetics | Faculty of Medicine

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
5 | numerical grade | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | undergraduate | --

Contents
This module gives an introduction to immunology. The following questions will be addressed: How does the body recognise and eliminate pathogens and tumour cells? How can the immune system damage its own body (allergies, autoimmunity)? Organs, cells and molecules of the immune system will be presented with an emphasis on genetic and molecular mechanisms of recognition and elimination of foreign substances by the immune system. The most important immunological techniques will be introduced and applied.

Intended learning outcomes
The students acquire a practical knowledge of cellular and molecular techniques for the analysis of the immune system. They are familiar with the mechanisms of self and non-self discrimination by the adaptive and innate immune systems. They acquire a fundamental knowledge of lymphocyte development as well as major immune effector cell functions and molecules.

Courses (type, number of weekly contact hours, language — if other than German)
V (1) + Ü (1) + P (3)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
written examination (approx. 45 minutes)
Assessment offered: Once a year, summer semester

Allocation of places
Biochemie (Biochemistry), Bachelor’s: 16 places. Selection process Biochemie (Biochemistry), Bachelor’s (180 ECTS credits): Should the number of applications exceed the number of available places, places will be allocated according to the following quotas: Quota 1 (two thirds of places): current average grade of successfully completed modules; among applicants with the same average grade, places will be allocated by lot. Quota 2 (one third of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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## Module Catalogue for the Subject Biochemistry

### Bachelor's with 1 major, 180 ECTS credits

<table>
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<th>Module title</th>
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<tbody>
<tr>
<td>Virology for biochemistry students</td>
<td>03-4S1VIR-BC-152-m01</td>
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### Module coordinator
holder of the Chair of Virology

### Module offered by
Faculty of Medicine

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### Duration
1 semester

### Module level
undergraduate

### Contents
Introduction to virology; the infectious cycle; virus structure and assembly; adsorption and entry; genomes and genetics; RNA-viruses: mRNA-synthesis and RNA-genome replication; retroviruses: reverse transcription and integration; DNA-viruses: transcription and genome replication. Foundations of cell biology. Introduction to the scientific method and scientific approach; principles of antiviral therapy and vaccination; introduction to clinical virology; HIV and AIDS. Safe work in a BSL-2 laboratory; cell culture; virus production, titre test; virus sequencing, phylogenetic analysis of viral quasispecies.

### Intended learning outcomes
Fundamental knowledge of molecular virology, the structure and replication of viruses and virus-host interactions; principles of antiviral vaccines and chemotherapeutics; principal techniques in cell and molecular biology for virological research.

### Courses
(type, number of weekly contact hours, language — if other than German)

V (1) + S (1) + P (3)

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- a) written examination (approx. 45 to 90 minutes) or b) log (10 to 20 pages) or c) oral examination of one candidate each (20 to 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 to 20 minutes per candidate) or e) presentation (20 to 30 minutes) or f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours)

Assessment offered: Once a year, summer semester

Language of assessment: German and/or English

### Allocation of places
Biochemie (Biochemistry), Bachelor's: 18 places. Selection process Biochemie (Biochemistry), Bachelor's (180 ECTS credits): Should the number of applications exceed the number of available places, places will be allocated according to the following quotas: Quota 1 (two thirds of places): current average grade of successfully completed modules; among applicants with the same average grade, places will be allocated by lot. Quota 2 (one third of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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<td>Human genetics for biochemistry students</td>
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<tr>
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<td>Faculty of Medicine</td>
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**Contents**

Fundamentals of and analytical methods in human and vertebrate cytogenetics. Characterisation of the normal human karyotype and chromosome aberrations. Introduction to chromosome evolution.

**Intended learning outcomes**

Students who complete this module will acquire the theoretical basis of and practical experience in human cytogenetics. They will learn how to prepare and identify human chromosomes and critically interpret cytogenetic findings.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (1) + Ü (1.5) + S (0.5)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 30 minutes)

**Allocation of places**

Biochemie (Biochemistry), Bachelor’s: 5 places. Selection process Biochemie (Biochemistry), Bachelor’s (180 ECTS credits): Should the number of applications exceed the number of available places, places will be allocated according to the following quotas: Quota 1 (two thirds of places): current average grade of successfully completed modules; among applicants with the same average grade, places will be allocated by lot. Quota 2 (one third of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module title

Pathobiochemistry

### Abbreviation

03-PBC-152-m01

<table>
<thead>
<tr>
<th>Module coordinator</th>
<th>Module offered by</th>
</tr>
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<tbody>
<tr>
<td>holder of the Chair of Clinical Biochemistry and Pathobiochemistry</td>
<td>Faculty of Medicine</td>
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<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
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### Contents

Fundamentals of selected topics in pathobiochemistry and pathophysiology.

### Intended learning outcomes

Students are familiar with the fundamentals of pathobiochemistry and pathophysiology.

### Courses

<table>
<thead>
<tr>
<th>type, number of weekly contact hours, language — if other than German</th>
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<td>V (1) + Ü (1) + P (3)</td>
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### Method of assessment

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<tr>
<td>a) written examination (approx. 45 to 90 minutes) or b) log (10 to 20 pages) or c) oral examination of one candidate each (20 to 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 to 20 minutes per candidate) or e) presentation (20 to 30 minutes) or f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours)</td>
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Assessment offered: Once a year, summer semester

Language of assessment: German and/or English

### Allocation of places

Biochemie (Biochemistry), Bachelor's: 6 places. Selection process Biochemie (Biochemistry), Bachelor's (180 ECTS credits): Should the number of applications exceed the number of available places, places will be allocated according to the following quotas: Quota 1 (two thirds of places): current average grade of successfully completed modules; among applicants with the same average grade, places will be allocated by lot. Quota 2 (one third of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
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<td>Molecular Biology laboratory course</td>
<td>08-BC-MOLP-152-m01</td>
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<tr>
<td>holder of the Chair of Biochemistry</td>
<td>Faculty of Chemistry and Pharmacy</td>
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<tbody>
<tr>
<td>1 semester</td>
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</table>

**Contents**

The module provides practical skills in the fields of recombinant engineering and characterization of macromolecular complexes, current biomolecular techniques, analysis of biochemical processes in vivo, and up-to-date imaging techniques.

**Intended learning outcomes**

The student has knowledge of molecular biology and is able to apply the contents in practical experiments.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (5)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or b) log (10 to 20 pages) or c) oral examination of one candidate each (20 to 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 to 20 minutes per candidate) or e) presentation (20 to 30 minutes) or f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours)

Assessment offered: Once a year, winter semester

Language of assessment: German and/or English

**Allocation of places**

Biochemie (Biochemistry), Bachelor’s: 24 places. Selection process Biochemie (Biochemistry), Bachelor’s (180 ECTS credits): Should the number of applications exceed the number of available places, places will be allocated according to the following quotas: Quota 1 (two thirds of places): current average grade of successfully completed modules; among applicants with the same average grade, places will be allocated by lot. Quota 2 (one third of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Chemie (Chemistry), Master’s: 6 places. Selection process Chemie (Chemistry), Bachelor’s (120 ECTS credits): Places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
---|---
Cell biology | 03-ZBP-152-m01

| Module coordinator | Module offered by |
---|---|
holder of the Chair of Medical Radiation and Cell Research | Faculty of Medicine

| ECTS | Method of grading | Only after succ. compl. of module(s) |
---|---|---|
5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
---|---|---|
1 semester | undergraduate | -- |

**Contents**

Becoming familiar with basic cell biological principles via hands-on training and seminars. Major topics are the structural organisation of eukaryotic cells, cell-cell and cell-matrix interactions, proliferation, differentiation and apoptosis.

**Intended learning outcomes**

Problem-oriented handling of eukaryotic cells under sterile conditions and understanding of principles of techniques for the analysis of cells. Understanding the molecular basis of cell biology and cellular malfunctions and their significance for disease development. Independent extraction of relevant information and presentation of selected examples of current literature.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (4) + S (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 minutes)
Language of assessment: German and/or English

**Allocation of places**

Biochemie (Biochemistry), Bachelor's: 12 places. Selection process Biochemie (Biochemistry), Bachelor's (180 ECTS credits): Should the number of applications exceed the number of available places, places will be allocated according to the following quotas: Quota 1 (two thirds of places): current average grade of successfully completed modules; among applicants with the same average grade, places will be allocated by lot. Quota 2 (one third of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
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<th>Module title</th>
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<td>Specific Microbiology 2 for Students in Biochemistry</td>
<td>07-5S2MiZ2-BC-152-m01</td>
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**Module coordinator**
holder of the Chair of Microbiology

**Module offered by**
Faculty of Biology

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</table>

**Duration**
1 semester

**Module level**
undergraduate

**Other prerequisites**
--

### Contents

In this module, students will acquire an in-depth insight into approaches and methods in microbiology.

### Intended learning outcomes

Students have acquired knowledge about general strategies and methods of microbiology. They are able to independently perform scientific laboratory work.

### Courses

(type, number of weekly contact hours, language — if other than German)

V (1) + S (1) + Ü (3)

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- a) written examination (approx. 45 to 90 minutes) or
- b) log (10 to 20 pages) or
- c) oral examination of one candidate each (20 to 30 minutes) or
- d) oral examination in groups of up to 3 candidates (approx. 15 to 20 minutes per candidate) or
- e) presentation (20 to 30 minutes) or
- f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours)

### Allocation of places

Biochemie (Biochemistry), Bachelor’s: 6 places. Selection process Biochemie (Biochemistry), Bachelor’s (180 ECTS credits): Should the number of applications exceed the number of available places, places will be allocated according to the following quotas: Quota 1 (two thirds of places): current average grade of successfully completed modules; among applicants with the same average grade, places will be allocated by lot. Quota 2 (one third of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

### Additional information

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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)

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Module title | Organic Chemistry 4  
---|---
Abbreviation | 08-OC4-152-m01

Module coordinator | Module offered by  
holder of the Chair of Organic Chemistry II | Institute of Organic Chemistry

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
5 | numerical grade | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | undergraduate | --

Contents
This module discusses biologically important bonding classes, their reactions and syntheses, working with special hazardous substances, complicated working and synthesis techniques, purification methods and product analysis.

Intended learning outcomes
Students are able to name important heteroaromatics and to formulate their reactions and syntheses. They are able to characterise and categorise dyes. Students are able to describe the structure and selective synthesis of proteins. In addition, they are able to describe the structure of the DNA, carbohydrates, fats, terpenes and steroids.

Courses
(type, number of weekly contact hours, language — if other than German)
V (2) + Ü (2)

Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (20 to 30 minutes) or c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes)
Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
§ 22 II Nr. 1 h)  
§ 22 II Nr. 2 f)  
§ 62 I Nr. 2
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<td>Organic Chemistry - advanced laboratory course for students of chemistry</td>
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<tr>
<td>holder of the Chair of Organic Chemistry II</td>
<td>Institute of Organic Chemistry</td>
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</table>

Contents

The module deepens the experimental skills of the student by handling special hazardous substances, complex work and synthesis techniques, extensive purification methods and laborious product analyses.

Intended learning outcomes

The student is able to handle special hazardous substances responsibly. He/She can carry out extensive syntheses, purification techniques and product analyses. He/She can use specific literature to plan experiments.

Courses (type, number of weekly contact hours, language — if other than German)

P (11)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Vortestate/Nachtestate (pre and post-experiment examination talks approx. 15 minutes each, log approx. 5 to 10 pages each) and assessment of practical performance (2 to 4 random examinations)

Language of assessment: German and/or English

Allocation of places

--

Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

--
Module title
Bioinformatics for advanced Students in Biochemistry

Abbreviation
07-4BFMZ4-BC-152-m01

Module coordinator
holder of the Chair of Pharmaceutical Biology

Module offered by
Faculty of Biology

ECTS
5

Method of grading
numerical grade

Duration
1 semester

Module level
undergraduate

Other prerequisites
--

Contents
This module will provide students with a theoretical and methodological introduction to fundamental techniques in molecular biology and drug analysis.

Intended learning outcomes
Students are able to analyse groups of drugs, using a variety of methods.

Courses
V (1) + Ü (4)

Method of assessment
Log (10 to 20 pages)
Language of assessment: German and/or English

Allocation of places
Biochemie (Biochemistry), Bachelor's: 4 places. Selection process Biochemie (Biochemistry), Bachelor's (180 ECTS credits): Should the number of applications exceed the number of available places, places will be allocated according to the following quotas: Quota 1 (two thirds of places): current average grade of successfully completed modules; among applicants with the same average grade, places will be allocated by lot. Quota 2 (one third of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
## Module title

**Introduction to Neurobiology**

### Abbreviation

03-98-PGN-152-m01

### Module coordinator

holder of the Chair of Clinical Neurobiology

### Module offered by

Faculty of Medicine

### ECTS

5

### Method of grading

numerical grade

### Only after succ. compl. of module(s)

--

### Duration

1 semester

### Module level

undergraduate

### Other prerequisites

--

### Contents

General fundamentals of neuroanatomy, important methods in neurobiology, diseases of the nervous system: symptoms, diagnosis, therapeutic options, discussion of novel research results.

### Intended learning outcomes

Students who successfully completed this module have acquired a fundamental knowledge about the structure and function of the nervous system. Giving oral presentations, they have developed the ability to critically reflect and discuss current scientific research results in the context of the field of neurobiology.

### Courses

**V (2) + S (3)**

Course type: S might be offered in Ü format

### Method of assessment

written examination (90 minutes) and successful completion of seminar/exercise

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<td>Current Methods of Protein Chromatography</td>
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<td>Chair of Biochemistry</td>
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</table>

**Contents**

In practical experiments the module provides the theoretical foundations and methodological skills in the purification of various proteins by modern chromatographic methods.

**Intended learning outcomes**

After attending the module, the students know the equipment necessary for chromatographic protein purifications. They know the various relevant parameters and are able to transfer their knowledge to other questions. They are able to evaluate the results and to document and discuss them in a protocol.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (5)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or b) log (10 to 20 pages) or c) oral examination of one candidate each (20 to 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 to 20 minutes per candidate) or e) presentation (20 to 30 minutes) or f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours)

Assessment offered: Once a year, winter semester

Language of assessment: German and/or English

**Allocation of places**

Biochemie (Biochemistry), Bachelor’s: 24 places. Selection process Biochemie (Biochemistry), Bachelor’s (180 ECTS credits): Should the number of applications exceed the number of available places, places will be allocated according to the following quotas: Quota 1 (two thirds of places): current average grade of successfully completed modules; among applicants with the same average grade, places will be allocated by lot. Quota 2 (one third of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<td>chairperson of examination committee Biochemie (Biochemistry)</td>
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**Contents**
Delved practice in a specific research topic; presentation of the results in a written protocol.

**Intended learning outcomes**
The student is able to deeply acquaint himself/herself with a specific research topic, and to present the results in a written protocol.

**Courses**
(type, number of weekly contact hours, language — if other than German)

| P | 8 |

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Log (approx. 20 pages)
Language of assessment: German and/or English

**Allocation of places**
--

**Additional information**
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**Referred to in LPO 1**
(examination regulations for teaching-degree programmes)
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<td>chairperson of examination committee Biochemie (Biochemistry)</td>
<td>Chair of Biochemistry</td>
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**Contents**
Delved practice in a specific research topic; presentation of the results in a written protocol.

**Intended learning outcomes**
The student is able to deeply acquaint himself/herself with a specific research topic, and to present the results in a written protocol.

**Courses**
(type, number of weekly contact hours, language — if other than German)
P (16)

**Method of assessment**
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Log (approx. 30 pages)
Language of assessment: German and/or English

**Allocation of places**
--

**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)
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<td>Virology 2 for Biochemistry Students</td>
<td>03-VIR2-BC-171-m01</td>
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<td>holder of the Chair of Virology</td>
<td>Faculty of Medicine</td>
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</table>

**Contents**

In the lecture the basic knowledge of virology is deepened by means of different virus groups. Simple molecular mechanisms of virus replication will be discussed on the basis of different viruses. The focus is on the understanding of the molecular host-virus interactions. The lecture should lead from clinical virology to molecular virology. In the practical part basic viral techniques such as virus purification, expression of recombinant viruses and determination of viral cell tropisms will be learned and applied in small groups. This course is based on the knowledge of Virology 1 for Bachelor.

**Intended learning outcomes**

The students will understand the molecular basis of viral replication and virus-host interaction and will be able to apply basic virological techniques independently.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + P (3)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or b) log (10 to 20 pages) or c) oral examination of one candidate each (20 to 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 to 20 minutes per candidate) or e) presentation (20 to 30 minutes) or f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours)

Assessment offered: Once a year, winter semester

Language of assessment: German and/or English

**Allocation of places**

Biochemie (Biochemistry) Bachelor's: 255 places.

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
--- | ---
Imaging methods in life-sciences | 08-BGV-171-m01

Module coordinator | Module offered by
holder of the Chair of Biochemistry | Chair of Biochemistry

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<tr>
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Duration | Module level |
--- | --- |
1 semester | undergraduate |

Contents

The module "Imaging Techniques in the Life Sciences" contains a lecture part and a seminar part. In the lecture part basic concepts of optics will be discussed and the functionality of a light microscope will be explained. Afterwards the principles of different variants of superresolution light microscopy will be introduced. Typical applications for the study of dynamic processes in cells and the temporal and spatial resolution potential of the different methods play a special role. Subsequently, the principles of electron microscopy (transmission electron microscopy and scanning electron microscopy) will be discussed. As far as possible, parallels to light microscopy will be developed. Typical electron microscopic applications in cell biology and structural biology will be discussed including correlative methods combining light and electron microscopy. Then the principles of more specific microscopy methods such as X-ray microscopy, scanning probe microscopy and nuclear resonance microscopy will be introduced. It will be worked out how the fields of application differ from those of classical microscopy methods and what the temporal and spatial resolution capabilities of the individual methods are. Finally, selected imaging methods from the clinical field (X-ray tomography, nuclear spin tomography and ultrasound) for the imaging of entire organisms will be discussed. As far as possible, parallels are drawn to the microscopic procedures. In the seminar part some aspects of the different methods will be deepened by case studies from the literature and by applying the theoretical basics.

Intended learning outcomes

The participants learn the functionalities of different imaging techniques. They will be able to classify typical advantages and limitations of the methods and understand general principles of imaging techniques. Building on this understanding, they can easily evaluate and classify other methods. In order to apply what they have learned independently, the participants will analyse a primary publication independently and answer questions on the imaging methods in writing. The participants will acquire competences in dealing with primary literature in a foreign language. By working on the questions, the participants are trained to recognise relevant information in the primary publication and to reproduce it in a different context. Participants will have the opportunity to optimise their written expression skills in a scientific environment by working on questions relating to primary literature.

Courses (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or b) log (10 to 20 pages) or c) oral examination of one candidate each (20 to 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 to 20 minutes per candidate) or e) presentation (20 to 30 minutes) or f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours)

Assessment offered: Once a year, winter semester

Language of assessment: German and/or English

Allocation of places

Biochemie (Biochemistry) Bachelor’s: 245 places.

Additional information

--
Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Transferable Skills
(20 ECTS credits)
General Key Skills
(5 ECTS credits)

Students may select any of the modules offered as part of the pool of general transferable skills (ASQ) of JMU.
Subject-specific Key Skills
(15 ECTS credits)
<table>
<thead>
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<td>Mathematical Biology and Biostatistics</td>
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<td>holder of the Chair of Bioinformatics</td>
<td>Faculty of Biology</td>
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</table>

**Contents**

Fundamental principles of the most important mathematical and statistical methods in biology.

**Intended learning outcomes**

Students will have acquired fundamental skills in the evaluation of experiments, the interpretation of readings and numbers as well as the mathematical description of biological processes.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (2)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 minutes)
creditable for bonus

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title
Information Literacy (Basic Level)

Abbreviation
41-IK-BM-152-m01

Module coordinator
head of University Library

Module offered by
University Library

ECTS
2

Method of grading
Only after succ. compl. of module(s)

Duration
undergraduate

Other prerequisites
--

Contents
Information literacy in an academic context: search strategies, resources, reference management, copyright, etc.

Intended learning outcomes
Students know what information is needed for what purpose. They are able to locate information that is relevant within their discipline(s) and beyond in a variety of resources and to evaluate this information. They recognise the difference in quality between information they have retrieved from specific, restricted access resources (databases) and information they have found on the free web. The module aims to equip students with the skills needed to find information and literature that is relevant to the topics of their papers.

Courses
Ü (0.5)

Method of assessment
presentation (approx. 15 minutes) with written elaboration (approx. 2 pages)

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
§ 99 I Nr. 1 (2 ECTS credits)
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<thead>
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<tr>
<td>Philosophical principles of sciences I</td>
<td>06-Ph-B-P2/1-152-m01</td>
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<td>holder of the Chair of Theoretical Philosophy</td>
<td>Institute of Philosophy</td>
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### Contents

Introduction to the theory of intellectual disciplines and to the historical and philosophical bases of the individual intellectual disciplines.

### Intended learning outcomes

Insight into the relationship of philosophy to individual intellectual disciplines; ability to reflect on the historical and intellectual origins of our knowledge culture; insight into the scope and limits of various intellectual disciplines; familiarity with, and ability to criticize, basic assumptions of visions of the world and systems of thought.

### Courses

(type, number of weekly contact hours, language — if other than German)

V (2)

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (45 minutes)

### Allocation of places

Only as part of pool of general transferable skills (ASQ): max. 20 places. Should the number of applications exceed the number of available places, places will be allocated according to the number of subject semesters. Among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated by lot as they become available.

### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
<thead>
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**Contents**

Fundamental principles of bioinformatics.

**Intended learning outcomes**

Students are proficient in methods for the analysis of DNA and protein databases.

**Courses** (type, number of weekly contact hours, language — if other than German)

| V (1) + S (1) |

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 20 minutes)

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
--- | ---
Toxicology and legal studies | 03-TR-152-m01

**Module coordinator**
Lecturer of lecture "Toxikologie und Rechtskunde"

**Module offered by**
Faculty of Medicine

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**Contents**
Basics of legal regulations for chemists (handling and transportation of hazardous materials), fundamentals of toxicology.

**Intended learning outcomes**
The students master the basics of legal regulations for chemists (handling and transport of hazardous substances) as well as the fundamentals of toxicology.

**Courses**
- V (1) + V (1)

**Method of assessment**
- written examination (approx. 90 minutes)

**Allocation of places**
- --

**Additional information**
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**Referred to in LPO I**
- § 22 II Nr. 1 h)
- § 22 II Nr. 2 f)
- § 22 II Nr. 3 f)
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<td>Contemporary research in biochemistry</td>
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**Module coordinator**

holder of the Chair of Biochemistry

**Module offered by**

Chair of Biochemistry

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**Duration**

2 semester

**Module level**

undergraduate

**Other prerequisites**

--

**Contents**

Presentation of current research results in the Biocentre colloquium and discussion of recent literature.

**Intended learning outcomes**

Students are introduced to the topics of current research in the life sciences.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V (2)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Wrap-up report (approx. 1 page)

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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<tr>
<td>Managing Director of the Institute of Physiology</td>
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</table>

**Contents**

Neurophysiology, cardiac/circulatory function, kidney, blood, respiration, acid/base homeostasis, endocrinology, nutrition and digestion, liver function.

**Intended learning outcomes**

Students are familiar with the fundamental principles of human physiology.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (3)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 60 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<td>Practical Course - external</td>
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**Module coordinator**
- chairperson of examination committee Biochemie (Biochemistry)

**Module offered by**
- Faculty of Chemistry and Pharmacy

**ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** |
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10        | (not) successfully completed | --                                       |

**Duration** | **Module level** | **Other prerequisites** |
-------------|------------------|-------------------------|
             | undergraduate    | Please consult with course advisory service in advance. |

**Contents**
The internship is carried out in a non-university research / diagnostic institution or in a company. The contents of the internship will be determined by the institution. The requirements in content shall correspond to an internship offered in the study program of the Biochemistry bachelor program (180 ECTS), what has to be defined in advance in consultation with the module coordinator.

**Intended learning outcomes**
Students are acquainted with the structures of non-university institutions and possess specific professional skills.

**Courses** (type, number of weekly contact hours, language — if other than German)
- P (0)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
- Log (approx. 30 pages)
- Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Contents**

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**Intended learning outcomes**

Students are acquainted with the structures of non-university institutions and possess specific professional skills.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (0)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Log (approx. 20 pages)

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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<td>Practical Course - abroad</td>
<td>08-AP-152-m01</td>
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**Module coordinator**
chairperson of examination committee Biochemie (Biochemistry)

**Module offered by**
Chair of Biochemistry

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**Duration**
undergraduate

**Other prerequisites**
Please consult with course advisory service in advance.

**Contents**
The internship is carried out at universities abroad and can be embedded within offered study programs (e.g., Erasmus). The content requirements should comply with those of the electives of the Biochemistry Bachelor program at the University of Würzburg (what has to be ascertained in advance under discussion with the module coordinator).

**Intended learning outcomes**
The students are familiar with working methods at universities abroad. Besides professional competences they have also acquired language and social skills.

**Courses** (type, number of weekly contact hours, language — if other than German)
P (0)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Log (approx. 30 pages)
Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Contents**

The internship is carried out at universities abroad and can be embedded within offered study programs (e.g. Erasmus). The content requirements should comply with those of the electives of the Biochemistry Bachelor program at the University of Würzburg (what has to be ascertained in advance under discussion with the module coordinator).

**Intended learning outcomes**

The students are familiar with working methods at universities abroad. Besides professional competences they have also acquired language and social skills.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (0)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Log (approx. 20 pages)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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<td>Practical Lab Course</td>
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**Module coordinator**

Chairperson of examination committee Biochemie (Biochemistry)

**Module offered by**

Chair of Biochemistry

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**Contents**

The lab course is carried out in a working group with biochemical and / or molecular biology research orientation at the University of Würzburg. The contents of the lab course have to be defined in advance in consultation with the module responsible. The lab course allows intensive training in biochemistry, molecular biology and / or bioinformatics research methods. The experiments and their results are documented in a written protocol.

**Intended learning outcomes**

After attending the lab course, the student has advanced methodological knowledge. He/She is able to transfer the methods used in this course on other issues and to assess their applicability. He/She is trained in scientifically correct documentation and discussion of experimentation and results.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (16)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Log (approx. 30 pages)

Language of assessment: German and/or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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## Module Catalogue for the Subject

### Bachelor’s with 1 major, 180 ECTS credits

**Biochemistry**

<table>
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<td>Practical Lab Course (abridged)</td>
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**Module coordinator**

Chairperson of examination committee Biochemie (Biochemistry)

**Module offered by**

Chair of Biochemistry

**ECTS**  | Method of grading       | Only after succ. compl. of module(s) |
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**Duration**

undergraduate

Please consult with course advisory service in advance.

**Contents**

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**Intended learning outcomes**

After attending the lab course, the student has advanced methodological knowledge. He/She is able to transfer the methods used in this course on other issues and to assess their applicability. He/She is trained in scientifically correct documentation and discussion of experimentation and results.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (8)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Log (approx. 20 pages)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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**Contents**

The module offers the opportunity to learn correct presenting and mediating scientific questions by giving a tutorial attendant to a lecture at the faculty of chemistry and pharmacy.

**Intended learning outcomes**

The students are able to adequately prepare and present scientific questions, and to guide students in lower semesters.

**Courses** (type, number of weekly contact hours, language — if other than German)

| Type (T) | (0) |

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Wrap-up report (approx. 2 pages)
Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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## Module Catalogue for the Subject
### Biochemistry
#### Bachelor's with 1 major, 180 ECTS credits

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The students are able to adequately prepare and present scientific questions, and to guide students in lower semesters.

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### Allocation of places

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### Additional information

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**Contents**

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**Intended learning outcomes**

After attending the module events, students have knowledge of the current progress of biochemical research. They can understand the discussed issues and summarize and reflect the contents in a short talk.

**Courses** (type, number of weekly contact hours, language — if other than German)

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**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- presentation (approx. 10 minutes)
- Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (approx. 10 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Courses**

(type, number of weekly contact hours, language — if other than German)

V (2) + S (1)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (approx. 10 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Module offered by**
Chair of Biochemistry

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**Contents**
The student attends a biochemistry-related project pre-agreed by the module responsible, subsequently reporting about the outcome.

**Intended learning outcomes**
The student acquires specific biochemistry-related skills and is able to reflect about the project in a final report.

**Courses** (type, number of weekly contact hours, language — if other than German)
S (1)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Wrap-up report (approx. 1 page)
Language of assessment: German and/or English

**Allocation of places**
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**Additional information**
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)
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### Module title
Biochemical Practical Seminar 2

### Abbreviation
08-BPS2-152-m01

### Module coordinator
Chairperson of examination committee Biochemie (Biochemistry)

### Module offered by
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Wrap-up report (approx. 1 page)
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### Additional information

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Wrap-up report (approx. 1 page)
Language of assessment: German and/or English

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### Contents

The module offers the possibility to learn the organization, training and responsible leadership of scientific experiments by assisting undergraduate students in a practical course.

### Intended learning outcomes

The student is able to train and to supervise undergraduate students in basic experimental procedures.

### Courses

(T (0))

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Wrap-up report (approx. 1 page)

Language of assessment: German and/or English

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**Contents**

This module equips students with an advanced knowledge of organometallics. It focuses on their structures and properties, special material classes, reactivity and technical processes.

**Intended learning outcomes**

Students are able to describe the structure and properties of organometallics in an appropriate manner. They are able to systemise them and characterise their structure and reactivity. In addition, they are able to develop and explain principles for the synthesis of elementary organic compounds.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (2) + Ü (1)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (20 to 30 minutes) or c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes)

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Contents**

The module provides the opportunity to plan and carry out complex syntheses after an individual research. Focuses are the handling of organometallic compounds, their synthesis and the work in inert atmospheres. Spectroscopical methods are used for the precise determination of the products.

**Intended learning outcomes**

The student is able to experimentally solve complex issues after an individual research. He/She can describe the technical backrounds an explain them written and verbal using technical language. He/She can independently plan and carry out the synthesis of a chemical compound. Therefor he/she can apply advanced laboratory techniques.

**Courses**

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**Method of assessment**

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**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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Module title | Abbreviation
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Symmetry, chemical bonding and light | 08-PC-SBL-152-m01

Module coordinator | Module offered by
--- | ---
Lecturer of lecture "Symmetrie, chemische Bindung and Licht" | Institute of Physical and Theoretical Chemistry

ECTS | Method of grading | Only after succ. compl. of module(s)
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9 | numerical grade | --

Duration | Module level | Other prerequisites
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2 semester | undergraduate | --

Contents

The module provides an introduction to the symmetry of molecules. It focuses on group theory, symmetry operations, point groups, character tables, and selection rules. The module deals with the chemical bond based on the qualitative MO theory and gives an introduction into the basics of computational chemistry. The module provides the opportunity to analyze the interactions between symmetry, chemical bonding and light in detail.

Intended learning outcomes

The student is able to analyze the symmetry of molecules. He/She can imply on the spectroscopic properties of a molecule by its symmetry.

Courses (type, number of weekly contact hours, language — if other than German)

\[ V (3) + Ü (2) + V (2) + Ü (2) \]

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German and/or English

Allocation of places

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Additional information

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<td>08-AS1-152-m01</td>
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<table>
<thead>
<tr>
<th>Module coordinator</th>
<th>Module offered by</th>
</tr>
</thead>
<tbody>
<tr>
<td>lecturer of lecture &quot;Chemie der Hauptgruppenelemente&quot; (Chemistry of Main-group Elements)</td>
<td>Institute of Inorganic Chemistry</td>
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</table>

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<th>ECTS</th>
<th>Method of grading</th>
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<tr>
<th>Duration</th>
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<th>Other prerequisites</th>
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<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
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</table>

## Contents

This module equips students with an advanced knowledge of the periodic table and selected elements. It focuses on bonding conditions, trends in the periodic table and the description and structure of elements. In addition, it introduces students to elementary organic chemistry, coordination chemistry and complex chemistry.

## Intended learning outcomes

Students are able to characterise main group elements and transition metal elements in terms of their structure, reactivity and fabrication. They are able to identify the coordination of the atoms. In addition, they have learned how to use the periodic table, an essential tool for chemists.

## Courses

(type, number of weekly contact hours, language — if other than German)

- V (2) + V (2)

## Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (20 to 30 minutes) or c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes)

Language of assessment: German and/or English

## Allocation of places

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## Additional information

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## Referred to in LPO I

(examination regulations for teaching-degree programmes)

§ 62 I Nr. 1
### Analytical Chemistry (lab)

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Analytical Chemistry (lab)</td>
<td>08-ANP-152-m01</td>
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<tr>
<td>holder of the Chair of Anorganic Chemistry</td>
<td>Institute of Inorganic Chemistry</td>
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**Contents**

The module provides the opportunity to apply the knowledge of the introductory lectures in a practical course. After a safety introduction the students experiment independently in the laboratory. Focuses are different analysis methods with unknown compounds.

**Intended learning outcomes**

The student is able to analyze unknown compounds using different methods. He/She is able to separate and analyze mixtures.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (12) + S (1)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Vortestate/Nachtestate (pre and post-experiment examination talks approx. 15 minutes each, log approx. 5 to 10 pages each) and assessment of practical performance (2 to 4 random examinations)

Assessment offered: Once a year, summer semester

Language of assessment: German and/or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title | Organic Chemistry 4
---|---
Abbreviation | 08-OC4-152-m01

Module coordinator | holder of the Chair of Organic Chemistry II
Module offered by | Institute of Organic Chemistry

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</tbody>
</table>

Duration | 1 semester
Module level | undergraduate
Other prerequisites | --

Contents
This module discusses biologically important bonding classes, their reactions and syntheses, working with special hazardous substances, complicated working and synthesis techniques, purification methods and product analysis.

Intended learning outcomes
Students are able to name important heteroaromatics and to formulate their reactions and syntheses. They are able to characterise and categorise dyes. Students are able to describe the structure and selective synthesis of proteins. In addition, they are able to describe the structure of the DNA, carbohydrates, fats, terpenes and steroids.

Courses (type, number of weekly contact hours, language — if other than German)
V (2) + Ü (2)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (20 to 30 minutes) or c) oral examination in groups of up to 3 candidates (approx. 15 minutes per candidate) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes)

Language of assessment: German and/or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
§ 22 II Nr. 1 h)  
§ 22 II Nr. 2 f)  
§ 62 I Nr. 2
### Module title

**Additional Qualification in Natural Sciences 3**

### Abbreviation

08-BC-ZQN3-152-m01

### Module coordinator

Chairperson of examination committee Biochemie (Biochemistry)

### Module offered by

Chair of Biochemistry

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<th>ECTS</th>
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</table>

### Duration

1 semester

### Module level

Undergraduate

### Other prerequisites

Please consult with course advisory service in advance.

### Contents

Extracurricular event dealing with a life-science issue, which represents a special subject-related expansion of scientific knowledge. This may be a module offered internally or externally of the University of Würzburg. Recognition as academic achievement is conducted in an individual assessment by the examination board.

### Intended learning outcomes

The student has improved scientific knowledge, which contributes to the sharpening of specific qualifications. In particular, he/she gained additional expertise that contributes to individual specialization.

### Courses (type, number of weekly contact hours, language — if other than German)

Ü (0)

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or b) log (10 to 20 pages) or c) oral examination of one candidate each (20 to 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 to 20 minutes per candidate) or e) presentation (20 to 30 minutes) or f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours)

Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

--
### Module Catalogue for the Subject
**Biochemistry**

**Bachelor's with 1 major, 180 ECTS credits**

<table>
<thead>
<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Additional Qualification in Natural Sciences 5</td>
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<tr>
<td>chairperson of examination committee Biochimie (Biochemistry)</td>
<td>Chair of Biochemistry</td>
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### Intended learning outcomes

The student has improved scientific knowledge, which contributes to the sharpening of specific qualifications. In particular, he/she gained additional expertise that contributes to individual specialization.

### Courses

(type, number of weekly contact hours, language — if other than German)

Ü (0)

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 45 to 90 minutes) or b) log (10 to 20 pages) or c) oral examination of one candidate each (20 to 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 to 20 minutes per candidate) or e) presentation (20 to 30 minutes) or f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours).

Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
## Module Catalogue for the Subject Biochemistry

### Bachelor's with 1 major, 180 ECTS credits

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<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Completive Qualification in Natural Sciences 3</td>
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<tr>
<td>chairperson of examination committee Biochemie (Biochemistry)</td>
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### Contents

Extracurricular event dealing with a life-science issue, which represents a special subject-related expansion of scientific knowledge. This may be a module offered internally or externally of the University of Würzburg. Recognition as academic achievement is conducted in an individual assessment by the examination board.

### Intended learning outcomes

The student has improved scientific knowledge, which contributes to the sharpening of specific qualifications. In particular, he/she gained additional expertise that contributes to individual specialization.

### Courses

(type, number of weekly contact hours, language — if other than German)

| Ü (o) |

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

| a) written examination (approx. 45 to 90 minutes) or b) log (10 to 20 pages) or c) oral examination of one candidate each (20 to 30 minutes) or d) oral examination in groups of up to 3 candidates (approx. 15 to 20 minutes per candidate) or e) presentation (20 to 30 minutes) or f) practical examination (on average approx. 2 hours; time to complete will vary according to subject area but will not exceed a maximum of 4 hours) |

Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
### Module Catalogue for the Subject Biochemistry

**Bachelor’s with 1 major, 180 ECTS credits**

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<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Completive Qualification in Natural Sciences 5</td>
<td>08-BC-EQN5-152-m01</td>
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**Module coordinator**

Chairperson of examination committee Biochemie (Biochemistry)

**Module offered by**

Chair of Biochemistry

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</table>

**Duration**

1 semester

**Module level**

undergraduate

**Other prerequisites**

Please consult with course advisory service in advance.

**Contents**

Extracurricular event dealing with a life-science issue, which represents a special subject-related expansion of scientific knowledge. This may be a module offered internally or externally of the University of Würzburg. Recognition as academic achievement is conducted in an individual assessment by the examination board.

**Intended learning outcomes**

The student has improved scientific knowledge, which contributes to the sharpening of specific qualifications. In particular, he/she gained additional expertise that contributes to individual specialization.

**Courses**

(type, number of weekly contact hours, language — if other than German)

| Ü (0) |

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO 1** (examination regulations for teaching-degree programmes)

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Thesis Area
(15 ECTS credits)
<table>
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<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tr>
<td>Bachelor Thesis in Biochemistry</td>
<td>08-BA-BC-152-m01</td>
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**Module coordinator**

Chairperson of examination committee Biochemie (Biochemistry)

**Module offered by**

Chair of Biochemistry

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</table>

**Duration**

undergraduate  --

**Contents**

The module enables the processing of a defined problem within a specified period by applying the scientific methods learned in the course of study.

**Intended learning outcomes**

The student has the ability to deal with a defined problem/issue using scientific methods and to document the results.

**Courses** (type, number of weekly contact hours, language — if other than German)

No courses assigned to module

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Bachelor's thesis (50 to 70 pages)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
## Module title
Defense of the Bachelor Thesis in Biochemistry

### Abbreviation
08-KOLL-BC-152-m01

## Module coordinator
Chairperson of examination committee Biochemie (Biochemistry)

## Module offered by
Chair of Biochemistry

## ECTS
3

## Method of grading
Numerical grade

## Only after succ. compl. of module(s)
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## Duration
1 semester

## Module level
Undergraduate

## Other prerequisites
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## Contents
In the Defense the student is presenting the results of her / his Bachelor-Thesis and is defending them in a subsequent discussion.

## Intended learning outcomes
The student is able to defend the results of her/his Bachelor’s Thesis in a scientific discussion.

## Courses
(K (0))

## Method of assessment
Final colloquium (approx. 30 minutes)
Language of assessment: German or English

## Allocation of places
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## Additional information
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## Referred to in LPO I (examination regulations for teaching-degree programmes)
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