

**Modulbezeichnung:** **Molecular biology (MSM-ME4)** **15 ECTS**  
(Molecular biology)

Modulverantwortliche/r: Christian Koch

Lehrende: Wilhelm F. Eisenbeiß, Lars Nitschke, Ruth Stadler, Christian Koch, Benedikt Schmid,  
Yves Muller

Startsemester: WS 2019/2020	Dauer: 1 Semester	Turnus: jährlich (WS)
Präsenzzeit: 210 Std.	Eigenstudium: 240 Std.	Sprache: Deutsch oder Englisch

### Lehrveranstaltungen:

Integrated course, combining lectures seminar and experimental work (in total: 15 SWS, only in winter term!), consisting of A1 to A4!

**Important: all parts of the course have to be attended (attendance in lab courses is compulsory)!**

Wahlpflichtmodul Molekularbiologie MSM - ME4 (WS 2019/2020, Vorlesung mit Übung, Benedikt Schmid et al.)

#### A1: Recombinant proteins

partly taught in **German** (30%), therefore only electable by students with beginners level German and advanced level English.

#### A2: Techniques in molecular genetics

taught in **German**

#### A3: Plant molecular biology

taught in **English**

#### A4: Structural biology

taught in **English**

### Inhalt:

**A1:** Recombinant DNA Polymerases are overproduced, purified, and biochemically characterized. Recombinant epitope-tagged eukaryotic transcription factors are purified by immunoprecipitation and detected with various antibodies. Lectures/seminars cover methods of recombinant protein expression, antibody detection, polymerase chain reaction, differences between pro- and eukaryotic gene expression. Modern chromatographic and analytical techniques used in protein purification.

**A2:** Handling of plasmid DNA, ligation, bacterial transformation, purification of genomic DNA and RNA from animal cells, transfection of animal cell lines, GFP reporters, Fluorescence activated cell sorting, genetic fingerprinting. Lectures/seminars cover these techniques.

**A3:** Plant molecular biology (taught in english) Detection of reporter genes in transgenic tobacco, immunological localization of a protein in *Plantago major*, transient expression of a reporter gene in onion and tobacco, fluorescence microscopy and confocal laser scanning microscopy. Lectures and seminars cover methods of plant gene technology, agrobacterium-mediated plant transformation, detection of genes, RNA and proteins, importance of genetically engineered plants in science and industry.

**A4:** Structural biology (taught in english): Protein structure determination. Major steps in protein X-ray crystallography will be performed including protein crystallization, symmetry and analysis of electron density maps, phase determination using molecular replacement, refinement and validation of the structural model. The course starts with an UNIX/LINUX introduction, the operating system used by the computer programs. Lectures and seminars cover in detail all steps of the X-ray structure determination process and highlight the application spectrum of this technique.

### Lernziele und Kompetenzen:

The students are able

- to understand the fundamentals of selected topics in molecular biology
- to utilize the modern experimental techniques in molecular genetics
- to determine protein structures using X-ray crystallography
- to prepare and to characterize of different samples (depending on chosen lab course) using appropriate experimental techniques and methods
- to interpret and to critically summarize experimental results in written form (lab report)
- to judge and to discuss in oral form their research results in the field of drug discovery in comparison to recent publications

- to work in smaller research teams (team ability)

**Literatur:**

Watson Baker et al: "Molecular biology of the gene" (Pearson International).

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**Verwendbarkeit des Moduls / Einpassung in den Musterstudienplan:**

Das Modul ist im Kontext der folgenden Studienfächer/Vertiefungsrichtungen verwendbar:

[1] **Molecular Science (Master of Science)**

(Po-Vers. 2013 | NatFak | Molecular Science (Master of Science) | Wahlpflichtmodul Molecular Science)

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**Studien-/Prüfungsleistungen:**

Molekulare Biologie - Molecular Biology (Prüfungsnummer: 30804)

(englische Bezeichnung: Molecular Biology)

Prüfungsleistung, mündliche Prüfung, Dauer (in Minuten): 45

Anteil an der Berechnung der Modulnote: 10%

weitere Erläuterungen:

Assessment and examinations:

O45 (PL) + LAB (SL): Oral examination (45 min, 2 examiners) + LAB (SL)

Calculation of the grade for the module: 100% oral examination

Prüfungssprache: Englisch

Erstablesung: WS 2019/2020, 1. Wdh.: keine Angabe

1. Prüfer: Christian Koch

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**Organisatorisches:**

Intended stage in the degree course: Mandatory elective module (Wahlpflichtmodul) or Elective Module (Wahlmodul) semester 1-3

Frequency of offer: **Annually - only in winter term**, taught between November and Februar!

**Bemerkungen:**

Courses of study for which the module is acceptable: M.Sc. Molecular **Life Science**