

StPO 2023 L3 Biology – Module Descriptions  
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Modules in biology	Compulsory [PF] Compulsory elective [WP]	LP	Qualification goals	Level	Prerequisites for participation	Prerequisites for the allocation of LP
Genetics and Microbiology & Anatomy and Physiology of Animals	PF	12	Students acquire theoretical and practical basic knowledge in the fields of genetics, microbiology and animal anatomy and physiology of animals: they are familiar with genetic and microbiological relationships and have a basic knowledge of anatomy, evolution, functional morphology and physiology of animals. Introduction to basic techniques biological examinations (including practical microscope and stereo magnifier, learning basic anatomical basic anatomical dissection preparation techniques) as well as carrying out and evaluating experiments. Acquisition of the necessary knowledge for the further modules in the above-mentioned disciplines.	Basic	None	<u>Coursework:</u> 2 protocols with drawings 2 x 7 Oral colloquia <u>Module examination:</u> 2 written exams or 2 e-exams
Cell and Developmental Biology & Anatomy and Physiology of Plants	PF	12	Students have basic theoretical and practical knowledge in the fields of cell biology, developmental biology and the anatomy and physiology of plants. They are familiar with cell and developmental biological relationships and have basic knowledge of the evolution of protists, basic structural plans and the function of plant organs and their phylogenetic origin as well as elementary plant physiological processes. Introduction to basic molecular methods of cell biology and plant physiological working techniques (including the use of microscopes, stereoscopes and simple measuring equipment, learning basic	Basic	None	<u>Coursework:</u> 2 x 7 protocols with drawings 7 Oral colloquia 7 online attestations <u>Module examination:</u> Written exam or e-exam

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			anatomical preparation and histochemical techniques) as well as carrying out and evaluating experiments. Acquisition of the knowledge required for the advanced modules in the disciplines mentioned.			
Evolution and Systematics	PF	6	Students recognize common plants and animals in the environment and are able to classify these organisms systematically. They master the necessary vocabulary to describe plants and animals and can explain the basics of taxonomy and systematics. Students can describe biogeographical patterns of global biodiversity and explain their development through evolutionary mechanisms in the context of the biotic and abiotic environment.	Basic	None	<u>Coursework:</u> Protocol <u>Module examination:</u> Written exam or e-exam: "Fundamentals of Biodiversity". Questions will be asked about the lecture and exercise.
Practical course in chemistry for pre-service biology teachers	PF	6	Fundamentals of general and inorganic chemistry; acid-base reactions; redox reactions; fundamentals of bonding theory; relationships of the periodic table; simple material chemistry of the main and secondary group elements; complex formation. Fundamentals of organic chemistry; orbital model, hybridization, chemical bonding and intermolecular interactions; nomenclature; simple chemistry of the various functional groups; typical reactions in organic chemistry (substitution, addition, elimination) together with the elementary discussion of reactive intermediates; isomerism, chirality and conformational analysis; energetics of organic reactions; resonance and aromaticity. Dimensional analysis (acids and bases); buffer solutions; heterogeneous chemical equilibria; complex compounds; redox reactions and	Basic module; export module (compulsory) for the subject Biology in the Teacher Training Program for Grammar Schools	None	<u>Compulsory attendance:</u> During the internship <u>Coursework:</u> Two colloquia (one in AC and one in OC) (approx. 10 minutes) on practical course <u>Module examination:</u> Written exam (90 minutes) on Inorganic Chemistry and Organic Chemistry

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			electrochemistry; hydrolysis of carboxylic acid esters (kinetics); catalysis; carbonyl compounds; aldol reaction; keto/enol tautomerism; Decarboxylation of $\beta$ -ketocarboxylic acids; carboxylic acids and sulfonic acid amides; $\alpha$ -amino acids; chromatography; chemistry and stereochemistry of carbohydrates; lipids (fats); polymers (plastics); biopolymers (proteins, starch, cellulose); handling hazardous substances.			
Introduction to Science Education – focused on Biology	PF	6	Students are familiar with didactic thinking and working methods. The subject-specific areas of competence can be safely distinguished from the interdisciplinary educational tasks of biology lessons. They know basic theories of teaching-learning research. Students can apply this knowledge in a way that is appropriate to the knowledge and taking into account the basic concepts for the design of teaching sequences.	Basic	None	<u>Coursework:</u> Organization of at least one seminar lesson; Reflection on a shadow study <u>Module examination:</u> Written exam (60 minutes)
Science Experiments for Learning about Human Biology	PF	6	Students will be able to understand human biology issues in different contexts, assess them objectively, evaluate them ethically and justify the personal and social relevance of biological topics. They are familiar with their scientific propaedeutic aspects and can didactically reconstruct and model this scientific content and create graded tasks for performance diagnosis and assessment in these subject areas.	Advanced	36 LP from the study area Basic modules.	<u>Coursework:</u> Written exam for exercise (45 minutes); organization of a teaching unit for the exercise <u>Module examination:</u> Oral examination for exercise (20 minutes)
Research Methods and Digitality in Science Education	PF	6	Students can use digital learning opportunities use digital learning opportunities in different contexts, create, objectively assess and	Advanced	36 LP from the study area Basic modules.	<u>Coursework:</u> Reflection and processing biology didactics

			methodically evaluate and assess the personal and social relevance with regard to the Justify the mediation value.			research literature and results (3-5 pages); Use and reflection digital media (hardware and software) (creation of an explanatory video of 3-5 minutes) <u>Module examination:</u> Variant A (Lecture + practice session): Digital portfolio, learning offer or explanatory video in the lecture (3LP) and Digital portfolio, learning offer or explanatory video in the practice session (3LP). Variant B (seminar + practice session): Evaluation of an interview with qualitative content analysis (3LP) and digital portfolio, learning offer or explanatory video (3LP).
Microbiology, Genetics and Cell Biology of Pro- and Eucaryotes	WP	6	Students should learn the basics of microbiology, cell biology and genetics in theory and theoretically and practically and thereby gain a more comprehensive understanding of biological interrelationships. The theory should be consolidated through	Advanced	36 LP from the study area Basic modules. The basic module "Genetics and Microbiology"	<u>Module examination:</u> Protocols (at least 4 pages per experiment) for the experiments in the course sections Microbiology, Genetics and cell biology

			experiments in the course be consolidated. In addition to the actual execution of the experiments with with the mathematical and graphical methods that are necessary for documentation, interpretation and discussion of the results. Particular emphasis is placed on the planning, execution and recording of the experiments and their assignment to the teaching units of the upper secondary school.		must be passed.	
Molecular Biology	WP	6	Acquisition of important basics of methodology of molecular biology and genetic engineering and the ability to participate in social discourse on these issues. The students should learn the basics of molecular biology and genetic engineering and in practice and thereby gain a more comprehensive understanding of biological interrelationships. The theory should be consolidated through experiments in the course. In addition to the actual execution of the experiments with the mathematical and graphical methods that are necessary for documentation, interpretation and discussion of the results. Particular emphasis is placed on the planning, execution and recording of the experiments and their and their assignment to teaching units of the upper secondary school.	Advanced	36 LP from the study area Basic modules. The basic module "Genetics and Microbiology" must be passed be passed.	<u>Coursework:</u> Writing a scientific protocol (at least 15 pages) <u>Module examination:</u> Presentation in the seminar (20-30 minutes)
Microbiology	WP	6	Students will deepen their theoretical and practical knowledge of the fundamentals of microbiology and gain a comprehensive understanding of biological relationships. The basics of the "structure and function of the prokaryotic cell, microbial growth and the synthesis performance of bacteria" are taught.	Advanced	36 LP from the study area Basic modules. The basic module "Genetics and Microbiology" must be passed	<u>Coursework:</u> Written exam on the course and the exercise (60 minutes) <u>Module examination:</u> Laboratory diary (at least 3-4 pages per experiment)

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			The theory will be combined with practical experiments in the course. In addition to the actual execution of the experiment, students will be familiarized with the mathematical and graphical methods necessary for the documentation, interpretation and discussion of the results. Particular emphasis is placed on the planning, execution and recording of the experiments and their to the teaching units of the upper secondary school.		be passed.	
From the Microcosm to the Macrocosm	WP	6	Students know the theoretical and practical basics of molecular biology; they have basic knowledge of structure-function relationships at the organismic and cellular level. They can, under guidance implement theoretical considerations in the planning and design simple experiments. They master mathematical and graphical methods for the evaluation of molecular biology experiments, their documentation, interpretation and discussion.	Advanced	36 LP from the study area Basic modules. The basic modules "Genetics and Microbiology" and "Cell and developmental biology" must have been passed.	<u>Coursework:</u> Presentation (approx. 20-30 minutes), minutes (5-10 pages) or Written exam (60-90 minutes) <u>Module examination:</u> Written exam (60-120 minutes) or portfolio (8-15 pages)
Biology of Vertebrates and of Humans	WP	6	In-depth knowledge of building plans and structures of vertebrates (especially humans) and their functions; understanding human biological topics; translating the acquired knowledge into the ability to recognize or derive structural, functional and evolutionary recognize or derive relationships; Acquisition and application of practical knowledge and skills (preparation/analysis of selected objects of investigation, scientific presentation of important aspects). Building on systematic and morphological basic knowledge, selected native organisms are organisms are dealt with in depth.	Advanced	36 LP from the study area Basic modules.	<u>Coursework:</u> a) Dissecting and sketching/drawing (3 drawings per course day) of the objects covered in the course; b) Correcting the sketches/drawings of a course day of a small group (once in the entire course) <u>Module examination:</u> E-exam for exercise and course (120 minutes)

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Identification and Systematics of Indigenous Animals	WP	6	The aim is the acquisition of identification skills for the identification and systematic classification of native invertebrates and vertebrates with a focus on relevance for schools. The contents of the module are on living and preserved animals exemplarily. Acquisition and application of scientific knowledge and practical skills are applied to specific examples. The own mediation skills are demonstrated in short presentations (e.g. animal portraits) in front of fellow students.	Advanced	36 LP from the study area Basic modules.	<u>Coursework:</u> Document the animals to be identified (10-12 pages); short presentation of an species (approx. 15 minutes) <u>Module examination:</u> Written exam with practical test as component (180 minutes) or portfolio (5-30 pages) or written elaboration (5-30 pages)
Skills in Recognition and Identification of Plants	WP	6	Competence to identify unknown plants to the to determine the exact species; recognizing plant species in the field.	Advanced	36 LP from the study area Basic modules. The basic module "Evolution and Biological diversity" must be passed.	<u>Coursework:</u> Excursion leader of a site inspection <u>Module examination:</u> Written exam (60 minutes) with practical part as a component (determination test and herbarium)
Morphology of Spermatophytes	WP	6	Students learn the most important modifications of plant organs (root, shoot, leaf) as adaptations to special environmental requirements. The focus is on well-known and less known crop plants. In addition to theoretical knowledge, practical skills (preparation, microscopy, documentation) in dealing with morphological and anatomical processing of plant material from collections and the presentation of their own	Advanced	36 LP from the study area Basic modules. The basic module "Evolution and biological diversity" must be passed.	<u>Coursework:</u> Documentation of the exercise content in the form of a digital portfolio of approx. 12 portfolio pages <u>Module examination:</u> Written exam (90 minutes) on the contents of the exercises

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			research is practiced.			
Plant Physiology	WP	6	Students know the theoretical and practical practical basics of plant physiology; they have basic knowledge about plant structure-function relationships on an organismic and cellular level. They are able to apply theoretical considerations in the planning and design simple experiments. They are proficient in mathematical and graphical methods for evaluation of plant physiological experiments, their documentation, interpretation and discussion.	Advanced	36 LP from the study area Basic modules. The basic module "Anatomy and Physiology of plants" must have been passed.	<u>Coursework:</u> One online certificate per course day (7 course days in total), writing short reports on the tests carried out (approx. 10 pages per course day per group of 2-3 people) <u>Module examination:</u> Written exam (90 minutes) on the contents of exercise and course
Animal and Human Physiology	WP	6	The students should deepen the basics of animal and human physiology and thereby gain an understanding of the mechanisms and performance of animal life processes and their adaptations to different ecological framework conditions. In didactically selected physiological and behavioral biology experiments, the core problems of animal and human physiology, learn how to deal with the the necessary equipment and technical aids and evaluate the experiments under supervision. Most of the experiments are suitable for use in biology lessons and are directly related to human biology.	Advanced	36 LP from the study area Basic modules. The basic module "Anatomy and Physiology of plants" must have been passed.	<u>Module examination:</u> Exam (120 Minutes)
Mechanisms of Evolution	WP	6	The aim is to provide students with a concept of modern evolutionary models, which allows students to independently and critically with the socio-political implications of evolutionary biology and this in the form of a self-planned lesson to the students.	Advanced	36 LP from the field of study Basic modules	<u>Module examination:</u> Lesson outline (short draft, approx. 20 pages incl. material)



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Conservation Ecology: From Basics to Application	WP	6	As part of this module, students learn the basics of the ecology of communities and their significance for nature conservation. The theory is reinforced through be consolidated through direct practical exercises. The students should become familiar with the methods of the ecology of biotic communities and apply them to data collection analysis and discuss them in a broad theoretical framework.	Advanced	36 LP from the field of study Basic modules	<u>Coursework:</u> Short presentation (approx. 15 minutes) <u>Module examination:</u> Protocol (approx. 10-15 pages) about the practical exercises
Conservation Biology	WP	6	In this module, the theoretical and acquired in the basic module theoretical and practical basics of conservation biology will be deepened. This includes learning the key concept of "biodiversity": meaning, threats, recording and conservation. The students are enabled to make a selection of national and international case studies national and international case studies relevant to make. In addition, students should acquire basic knowledge of practical aspects of nature conservation in Germany in order to be able to select excursion destinations relevant to nature conservation for their lessons.	Advanced	36 LP from the field of study Basic modules	<u>Coursework:</u> Excursion <u>Module examination:</u> Written exam (90 minutes) on the content of the exercise either in German or English language (question in English language)
Ecology and Conservation	WP	6	Deepening theoretical knowledge of ecology and environmental protection. Expanding and stabilizing knowledge of the ecophysiological requirements of organisms. Development of subject-didactic and subject-practical skills for competence-oriented grammar school teaching.	Advanced	36 LP from the study area Basic Modules. The basic modules "Evolution and Biological Diversity" and "Anatomy and Physiology of Plants" must be passed.	<u>Module examination:</u> Written elaboration of the planning (at least 12 pages), implementation and reflection of a learning unit for pupils on the topic "Forest excursion".
Plant Ecology and Interactions	WP	6	After completing the module, students will have	Advanced	36 LP from the study area Basic Modules. The basic module	<u>Coursework:</u> Protocol (approx. 3-5 pages)

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			knowledge of the ecology of plants ecology of plants and their animate and inanimate environment as well as the interactions between plants and animals (e.g. pollination, herbivory) and microorganisms and are able to link these with the knowledge already acquired. They can identify ecologically relevant characteristics of plants and apply environmental microbiological methods apply them.		"Evolution and Biological Diversity" must be passed.	<u>Module examination:</u> Written exam (120 minutes)
Plant Ecology	WP	6	In this module, students should in-depth knowledge of ecological relationships and the factors that influence influence plants and vegetation, are taught. Through their own and experiments, students are taught ecological laws and given suggestions for planning school experiments.	Advanced	36 LP from the study area Basic Modules. The basic module "Evolution and Biological Diversity" must be passed.	<u>Coursework:</u> Minutes (approx. 5-8 pages) <u>Module examination:</u> Written exam (60 minutes) on the contents of the lecture and the exercise.
Out-of-School Learning Locations – Extended Field Trips	WP	6	Sound theoretical knowledge of the biotic (including anthropogenic) and abiotic factors that determine the respective habitat as well as the organisms that occur (morphology, anatomy, ecology, phylogeny); confident handling of context-relevant (school, science) working materials, media, methods and organisms; networking of scientific, practical, didactic, logistical and social competence-related aspects to implement the acquired knowledge in the school context.	Advanced	36 LP from the study area Basic modules.	<u>Coursework:</u> Paper or presentation (20-30 minutes) <u>Module examination:</u> Portfolio (8-15 pages)
Conservation and Biodiversity	WP	6	Students deepen their theoretical and practical knowledge of conservation biology. This includes an understanding of the threats to and protection of biodiversity. They also acquire basic knowledge of structural/functional	Advanced	36 LP from the study area Basic Modules. The basic modules "Anatomy and Physiology of Plants",	<u>Coursework:</u> Presentation (20-30 minutes), Protocol (5-10 pages) or written exam (60-90 minutes)

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			relationships at an organismic and ecological level.		"Anatomy and Physiology of Animals" and "Evolution and Biological Diversity" must be passed.	<u>Module examination:</u> Written exam (60-120 minutes) or portfolio (8-15 pages)
Plant Knowledge – Central Europe	WP	6	The module extends knowledge of botanical forms well beyond the standard knowledge. In summer, botanically valuable habitats are studied and the focus on nature conservation aspects is sharpened. In winter, the focus is on gymnosperms and evergreen angiosperms, which are otherwise neglected. The use of fruits, buds and bark as identification aids is emphasized and the taxonomic delimitation of plants based on very limited identification features is trained. Students of cellular/microbiological subjects will use this module to gain knowledge of botanical forms and the basics of applied botany.	Advanced	36 LP from the study area Basic modules.	<u>Coursework:</u> Protocol <u>Module examination:</u> Written elaboration
Forensic Biology	WP	6	Students will be introduced to the basics of forensic biology. The theory should be consolidated. Students should become familiar with the specific methods of forensics be familiarized with the specific methods of forensics. Particular emphasis is placed on the transferability and application of molecular and taxonomic methods for the solution of forensic problems.	Advanced	30 LP from the basic modules; the basic module "Introduction to Organismic Biology" must be completed.	<u>Module examination:</u> Written elaboration
Basics of Ecology and Conservation	WP	6	After completing the module, students will be able to reproduce theoretical and practical basic knowledge of ecology and nature conservation. They will be able to present basic ecological and nature conservation contexts in	Advanced	None	<u>Coursework:</u> Protocol for an outdoor project <u>Module examination:</u>

			<p>a well-founded manner. They are able to correctly apply basic technical terminology from the field of ecology and nature conservation and expand their technical vocabulary over the course of their studies. They can also name basic methods of ecology and nature conservation, describe their purposes and apply them in practice. This may include the practical use of landing nets, binoculars, microscopes and stereo magnifying glasses, setting up experiments and field observations. They are also able to carry out and evaluate simple experimental and field observations. They will be able to use the skills and knowledge they have acquired as a basic for further specialist work in the field of ecology and nature conservation as well as related disciplines and to expand these to this end.</p>			<p>Written exam or e-exam: "Introduction to Ecology and Nature Conservation". Questions will be asked about the lecture and exercise.</p>
ProfiWerk Biology	PF	6	<p>The students combine biological knowledge and subject-specific didactic arguments in the competence-oriented planning and design of biology lessons in relation to the basic concepts. The students know scientific ways of thinking and working methods, teaching media and forms of tasks. They know how to classify these didactically, apply them in a theory-based way, in line with requirements and specifically skills in the classroom. Building on this, students will develop use selected subject-specific and develop an exemplary understanding of the understanding of the subject.</p>	Advanced	<p>24 LP from the study area Basic Modules, as well as the examination performance of the basic module "Introduction to the Didactics of Natural Sciences - Focus on Biology".</p>	<p><u>Coursework:</u>          Organization of a biology lesson  <u>Module examination:</u>          Design of a lesson plan (5-8 pages)</p>

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PraxisLab Biology	PF	6	<p>The module builds on the associated module ProfiWerk Biology and ProfiPraxis and is completed by the parallel modules PraxisLab EGL and PraxisLab of the other subject. Students should use selected basic subject and methodological concepts to transfer their exemplary understanding of the subject system into the staging of lessons via a didactic modelling process of tasks and classify and systematize the knowledge they have acquired, the observations they have made and the experience they have gained in the context of teacher professionalization in a broad and differentiated way.</p>	Practice	<p>Coursework ProfiWerk Biology Simultaneous participation in the PraxisLab modules of the other subject and PraxisLab EGL.</p>	<p><u>Compulsory attendance</u> <u>Coursework:</u> Carrying out at least one teaching experiment in the school internship and working on a task related to subject concepts in the block seminar as well as creating a video (5 min.) in the accompanying seminar <u>Module examination:</u> Digital portfolio, internship report or project work 8-15 p.</p>
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