

Topics for the oral part of the SDE

Analytical Chemistry	The state doctoral examination is oral and covers the entire area of analytical chemistry. The students also select one chemical field (inorganic chemistry, organic chemistry, biochemistry or physical chemistry) and one elective subject from instrumental methods of analysis (separation, optic or electrochemical methods).
Plant Anatomy and Physiology	Topics for the oral part of the state doctoral examination include: anatomy and physiology of plants, molecular and cellular biology of plants, and two electives selected by the doctoral board as proposed by the student in consultation with the supervisor (generally from the list of subjects taught at the faculty). A basic knowledge of the given subject is required, along with the ability to apply this knowledge in a broader context. Questions take into account the scientific orientation of the student, and detailed current knowledge is expected in areas closely related to the dissertation work. More detailed information is available at http://kfrserver.natur.cuni.cz/studium/phd-pozadavky.html
Inorganic Chemistry	The state doctoral examination is oral and consists of the following areas: 1) general inorganic chemistry: bonding, structure and reactivity. 2) Systematic inorganic chemistry of the main elements and secondary groups. 3) Methods of analysis of inorganic substances
Anthropology and Human Genetics*	Subject areas tested include anthropology, human genetics, human ecology and the particular specialization of each doctoral student, which together make a single state doctoral examination. Students must pass this test to be able to defend their dissertation.
Applied Geology	The state doctoral exams is oral, public and with a committee whose members are approved by the subject-area board. The students must prove knowledge in three areas. The students selects the areas together with the supervisor and the chair of the subject-area board. The three areas are then approved by the subject-area board. In each of the areas, the student needs to prove detailed knowledge, perfect orientation and ability to create own critical view.
Biochemistry	The state doctoral examination consists of three subjects: general biochemistry, a more specialized area of biochemistry (e.g. enzymology, proteins, lipids), while the third topic is related to the dissertation.

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Botany	<ul style="list-style-type: none">• The state doctoral examination must be taken according to the particular study plan, generally in the 3rd or 4th semester for full-time students. The application to take the state doctoral examination must be completed by the student and submitted to the Department of Doctoral Studies.• The examination takes place before an examination committee, it is not a formal or factual reiteration of the state master examination, and it is adapted to the specific dissertation topic of the student. The doctoral examination demonstrates (i) a general overview of the entire discipline of botany (the subject listed in the application should be "Botany", and (ii) detailed knowledge in the field of dissertation (the application should state "Topic of dissertation", or possibly a shortened title).• In addition to these two basic subjects, in the application the candidate specifies another field of interest, generally from the following list: algology, mycology, lichenology, bryology, phytopathology, ecology of algae, ecology of fungi, ecology of lichens and mosses, system and evolution of higher plants, biosystematics, reproductive biology, molecular markers, numerical methods in taxonomy, vegetation of Central Europe, ecology of plants, biomes of the Earth, community ecology, paleoecology, population biology of plants, phytogeography.• Along with the doctoral examination application, it is necessary to submit a current progress report on dissertation stating with the initial objectives of the work, current progress, planned changes in research, etc. (expected to be roughly 10 pages in length). This report may include published works or articles ready for publication referred to in the introductory analysis section. This report must be submitted to the chair of the committee at least 14 days before the examination.• If the student fails to pass the examination, the examination committee generally recommends literature and subject areas for the student to study. Repeated examinations consist of the same subject areas as the initial exam. A new report on the current state of the dissertation must be also submitted.
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Demography	<p>In order to register for the state doctoral examination (which should be completed by the end of the 2nd year), it is required to fulfill the study requirements (courses) according to the ISP and submit an electronic version of the dissertation in progress. In the case of a dissertation in the form of a monograph, the dissertation in progress is submitted in a minimum of 40 standard pages (72 thousand characters), containing an introductory dissertation text describing the essence of the doctoral student's research efforts and other selected parts of the dissertation.</p> <p>In the case of a dissertation in the form of a collection of scientific articles, at least one original published/accepted article related to the topic of the dissertation, accompanied by an introductory text of the dissertation describing the nature of the doctoral student's research demographic efforts (of at least 10 pages) and a publication plan is required.</p> <p>The State Doctoral Examination is held before an examination committee and consists of two parts, an oral examination (verifying the scientific overview of the dissertation topic) and a defence of the dissertation. The thesis is evaluated by two opponents. The defence of the dissertation in progress (a presentation using presentation techniques lasting up to 15 minutes) is aimed at defending partial results in a wider professional forum and discussing the chosen methods before the thesis is completed.</p> <p>In addition to knowledge, the exam verifies in particular the following skills: critical and systematic thinking, explaining the nature of the problem, making meaningful distinctions, arguing, placing the problem in a broader context, distinguishing between general and specific, giving relevant empirical examples, drawing and formulating generalised conclusions.</p> <p>The dissertation defence (ppt presentation of max. 45 minutes) aims to demonstrate in a wider professional forum the ability to defend the procedures and results of the doctoral research presented in the dissertation and in the discussion the ability to debate scientifically. In order to apply for the dissertation defence, it is required to pass the State Doctoral Examination and fulfil all the obligations prescribed in the ISP (study abroad, publication criteria, etc.). The doctoral student submits the dissertation and signs up for the dissertation defence so that the defence can take place within the standard study period.</p>
Didactics of Chemistry	<p>The state doctoral examination for the didactics of chemistry consists of three subject areas:</p> <ul style="list-style-type: none"> a) chemistry - encompassing inorganic, organic, analytic, physical, nuclear and biochemistry b) teaching/psychology - includes pedagogy, psychology and general didactics c) didactics of chemistry - general didactics of chemistry, didactics of general and inorganic chemistry, and didactics of organic chemistry and biochemistry <p>During the state doctoral examination, each student demonstrates knowledge in all three subject areas. Questions asked generally respect the focus of the student's dissertation.</p>
Ecology	<p>In accordance with Art. 14 of the Regulations of Study and Examinations, the Doctoral Board has set the following requirements for the state doctoral examination: the state doctoral examination is a formal or factual reiteration of the state master's examination and it is adapted as much as possible to specific work of the student. The first question is generally regarding the dissertation topic, the second is field-related and the third specifically focuses on the doctoral research.</p>

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<p>Environmental Science</p>	<p>The focus of the state doctoral examination (selection of combined subject areas) depends on the focus of the dissertation and the particular study plan of the candidate. The state doctoral examination typically consists of one main and one secondary subject area. The main subject area is based on the focus of the dissertation. The secondary subject area requires that the candidate demonstrates a broader range of knowledge in related fields. Both subject areas of the examination are selected by the chairman of the Doctoral Board from the six subject areas listed here, following consultation with members of the Doctoral Board and the student's supervisor. In the event of interdisciplinary projects, the state doctoral examination may also address other relevant topics.</p> <p>It is recommended that students discuss suitable examination subject areas with the chairman of the Doctoral Board.</p> <p>According to the CU Regulations for Study and Examinations, the state doctoral examination consists of a single part comprising subject areas. The state doctoral examination subject areas for the program correspond to the main aspects of environmental science:</p> <ol style="list-style-type: none"> 1) meteorology, climatology, atmospheric chemistry, air protection 2) hydrochemistry, limnology, water protection 3) ecology, conservation of biological diversity 4) pedology, geochemistry and geological conservation 5) general and special methodologies of environmental science 6) ecotoxicology and environmental chemistry
<p>Philosophy and History of Science</p>	<p>Considering the diversity of the topic, the subject areas for the state doctoral examination are established individually. They are discussed by the student and the chairman of the Doctoral Board, who then submits them to the board for approval.</p>
<p>Physical Geography and Geoecology</p>	<p>The examination consists of three subjects, determined by the Doctoral Board following consultation with the supervisor, taking into account the area of expertise of the candidate. One basic required subject is general and regional physical geography, the other two subjects are related to the candidate's particular area of specialization.</p>

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Physical Chemistry	<p>The state doctoral examination begins with a brief statement from the doctoral candidate about the doctoral research, the results achieved, and their publication - the presentation is strictly oral (no projections) and typically lasts about three minutes. This is followed by the examination itself, which verifies the student's knowledge in various areas of chemistry, especially theoretical and experimental physical chemistry. Depending on the dissertation topic, the student is further examined on (i) the foundations of the physical chemistry of polymers, (ii) foundations of quantum mechanics, molecular structure and spectroscopy, or (iii) biophysical chemistry. During the examination the student should demonstrate the ability to think independently and to solve problems, while possessing a broad overview and sufficient knowledge of individual areas of physical chemistry, interdisciplinary relationships and current trends in physical chemistry.</p>
Animal Physiology*	<p>The state doctoral examination is oral and it is taken before a committee. The aim of the examination is to verify student's knowledge in selected key areas of animal physiology. To pass the exam, it is necessary to fulfil the requirements of one of the areas of each of the three topics:</p> <p>A - Cell and molecular physiology B – Regulation mechanisms C – Organ/Special physiology</p> <p>A) 1 – Animal cell physiology, cell signalling 2 – Bioelectric phenomena and membrane transport processes 3 – Bioenergetics and metabolism 4 – Molecular pharmacology</p> <p>B) 1 – Neural and humoral regulation 2 – Immunity mechanisms 3 – Adaptive mechanisms and chronobiology 4 – Integrative function of the CNS</p> <p>C) 1 – Cardiovascular and respiratory physiology 2 – Gastrointestinal and renal physiology 3 – Reproductive and developmental physiology 4 – Physiology of muscles and connective tissue 5 – Neurophysiology</p>

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Geology	<p>During the state doctoral examination the candidate demonstrates knowledge in at least two subject areas related to the doctoral research (see the list below). During the state doctoral examination the candidate must demonstrate outstanding orientation in the subject area and the ability to form own critical opinions.</p> <p>List of subject areas:</p> <ul style="list-style-type: none"> • Igneous petrology • Metamorphic petrology • Structural geology • Geotectonics • Geochemistry • Analytical methods in geosciences • Mineralogy • Economic geology • Historical and stratigraphic geology and paleogeography • Paleobiology of invertebrates • Paleobiology of vertebrates • Micropaleontology • Paleobotany • Sedimentary petrology and sedimentary geology • Quaternary geology • Earth remote sensing • Use of GIS data in geology
Immunology*	<p>The state doctoral examination is taken before a committee appointed by the dean based on the recommendation of the Doctoral Board. The examination covers three areas: molecular biology, cell biology and immunology. In each area the student draws questions from topics posted on the website of the Immunology Doctoral Board (www.kav.cas.cz/pdsb/, then immunology, then signature).</p>

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<p>Cartography, Geoinformatics and Remote Sensing</p>	<p>The state doctoral examination has two parts: a) discussion of the topic of dissertation (theory and selected empirical aspects) and b) examination in three specialized areas of study with the following topical content:</p> <p>Geographic information systems Perception and modelling of the world around us. Spatial data models and structures. Acquisition and storage of spatial data. Handling of spatial data. Accuracy of spatial data. Definition and function of the geoinformation system, analytical function of GIS. GIS applications. Database systems, data servers. Data standards, metadata. Standard software and programming languages. GIS development trends. Distribution of spatial information and digital maps on the Internet.</p> <p>Remote sensing research Instruments for remote research. Methods for obtaining, recording and distributing data. Visual data and their visualization. Digital processing of satellite data for remote research. Geometric transformation and correction of data. Radiometric correction and atmospheric impact. Supervised classification methods. Cluster analysis and unsupervised classification. Spectral and spatial signs. Approaches to data analysis using multi/hyperspectral data, multi-temporal data. Application of remote research methods. Analysis of radar image data and laser data. Current trends in the development of remote sensing research.</p> <p>Cartography Mathematic cartography – reference areas, geodetic coordinates, spatial coordinates, cartographic imaging, general laws of distortion, simple, general depiction, depiction used for lands of the Czech Republic, European and global geodetic systems, transformation between systems. Cartographic generalization – elements of generalization, cartographic abstraction, method of selection, method of generalizing shapes, quantitative and qualitative characteristics. Cartographic technology - map symbols, presentation of spatial phenomena including reliefs, preparation of projects, editing, processing of compiled and published originals. Digital cartographic technology and trends. Historical cartography.</p>
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<p>Macromolecular Chemistry</p>	<p>The state doctoral examination begins with a brief statement from the doctoral candidate about the doctoral research, the results achieved, and their publication - the presentation is strictly oral (no projections) and typically lasts about three minutes.</p> <p>This is followed by the examination itself which verifies the knowledge of the student in the areas of chemistry, physical chemistry and foundations of polymer physics, experimental methods of polymer research (and not only those used by the student in dissertation), interdisciplinary relationships and trends in polymer science.</p>
<p>Microbiology*</p>	<p>The state doctoral examination verifies the student's general knowledge in the field of microbiology - the extent and depth of theoretical knowledge with respect to the current state of the field. The examination is also intended to test the scientific thinking of the student, i.e. the ability to express the essence of a given problem and to propose own solutions.</p> <p>The state doctoral examination consists of a single part (oral examination) on two subject areas:</p> <p>1) required subject area:</p> <ul style="list-style-type: none"> - physiology of microorganisms - genetics of microorganisms <p>2) elective subject (the student selects one of the following areas, depending on the dissertation topic):</p> <ul style="list-style-type: none"> - molecular biology - medical microbiology <p>The examination focuses on three levels of knowledge of the doctoral student in microbiology:</p> <ol style="list-style-type: none"> i) theoretical knowledge, ability to orient within the entire field ii) knowledge of principles and possible methods and techniques used in current microbiology both in general, and with respect to the dissertation iii) detailed knowledge of issues related to the focus of the dissertation work. <p>The examination includes a very short introductory presentation (up to 10 minutes), where the student introduces the topic of his/her research to the members of the committee.</p> <p>You can find questions on individual subject areas posted online at https://www.natur.cuni.cz/fakulta/studium/agenda-phd/navody-a-informace/programy/mikrobiologie</p>
<p>Modelling of Chemical Properties of Nano- and Biostructures</p>	<p>During the state doctoral examination the candidate must demonstrate broad knowledge in the field of modelling chemical properties.</p>

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<p>Molecular and Cellular Biology, Genetics and Virology*</p>	<p>Subject areas for questions asked during the state doctoral examination</p> <ol style="list-style-type: none"> 1) molecular biology is a required subject area for all students 2) a second area is chosen by the student from these three - cell biology, genetics, or virology 3) the third subject is based on the topic of dissertation. <p>You can find questions on individual subject areas online at https://www.natur.cuni.cz/fakulta/studium/agenda-phd/navody-a-informace/programy/molekularni-a-bunecna-biologie-genetika-a-virologie</p>
<p>General Issues in Geography</p>	<p>The state doctoral examination consists of two parts:</p> <ol style="list-style-type: none"> 1) Theoretical/methodological discussion of dissertation, 2) Examination in general geography questions from one of the three following areas: <ol style="list-style-type: none"> 2a) Development of thought in geography, 2b) Development of the landscape, 2c) Geography education. <p>In the first part of the state doctoral examination the doctoral candidate introduces the dissertation to the committee, the focus of own research, the theoretical and methodological points of departure, and the current state of progress on the dissertation work (max. 15 minutes, ppt presentation). This is followed by a discussion.</p> <p>In the second part of the state doctoral examination, taking into account the dissertation topic the commission verifies the candidate's ability to place the research into the context of changing general assumptions (e.g. key theories, concepts, directions/schools and individuals) and methodological approaches in geography and related sciences/disciplines (in the area of geography education this might involve pedagogy, psychology, and general or specialized didactics).</p> <p>In addition to general knowledge, the examination is particularly intended to verify the following skills: critical thinking, explaining the essence of a problem, distinguishing meaning, presenting arguments, placing a problem in broader contexts, general and specific differentiation, presenting relevant empirical examples, and drawing and formulating general conclusions.</p>

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Organic Chemistry	<p>The state doctoral examination is divided into three thematic areas, one of which is always organic chemistry, the other two are proposed by the supervisor based on the dissertation topic and approved or modified by the Doctoral Board. It is possible to choose from the following topics: organic synthesis, organometallic chemistry, structure and reactivity of organic molecules (stereochemistry and reaction mechanisms), analytical methods in organic chemistry, natural substances (alkaloids, peptides, carbohydrates, lipids), bioorganic chemistry, physical organic chemistry and reaction mechanisms. The student must prove advanced knowledge of the topics and demonstrate the ability to apply the knowledge to specific problems.</p>
Parasitology*	<p>The aim of the examination is to test the extent of the student's knowledge in the field of parasitology, his/her ability to grasp the essence of problems and form own opinion, also applying knowledge from other fields to parasitology. The exam focuses on the following subject areas: (1) protozoology, (2) helminthology, (3) medical entomology, (4) and an elective subject related to the dissertation topic. Depending on the type of research being conducted, the doctoral student is required to demonstrate outstanding knowledge in one of the thematic subject areas (1-3) and in subject 4. The other two subject areas are tested on the level of the course Foundations of Parasitology or in relation to the relationship to the student's dissertation . (Example: If the doctoral student is researching anti-microbial peptides in parasitic insects, the examination verifies detailed knowledge of medical entomology and the immunology of invertebrates or biochemistry; helminthology and protozoology is tested on the level of the course Foundations of Parasitology or in relation to anti-microbial peptides).</p>

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Regional and Political Geography	<p>The state doctoral examination consists of two parts:</p> <ol style="list-style-type: none">1) Theoretical/methodological discussion of the dissertation,2) Examination in regional and political geography, or particular subject areas:<ol style="list-style-type: none">2a) Theoretical questions in regional geography or political geography, Doctoral students who were enrolled before October 1st, 2014 also select two of the following subject areas:2b) Global and international differentiation of the world, regional differentiation of the state and micro-regional analysis, regional development of Czechia in the European context,2c) Geography of cities and land use planning, rural geography and environmental protection, geography of tourism, foreign trade and external relations. 2c subject areas may also include selections from subject areas 2b) and 2c) of the Social Geography and Regional Development study programme). <p>Doctoral students enrolled after October 1st, 2014 also select one of the following subject areas: Geography of globalization and European integration, global and international differentiation of the world, political geography and geopolitics, regional differentiation of the state, geography of tourism and recreation, development studies, landscape geography, with respect to the dissertation topic and completed partial study requirements set forth in the individual plan. (Recommended study materials are listed in SIS for individual subjects "for PGS").</p> <p>In the first part of the state doctoral examination the doctoral student presents the dissertation to the committee, as well as the focus of research, the theoretical and methodological points of departure, and the current state of progress on the dissertation work (max. 15 minutes, ppt presentation). This is followed by a discussion.</p> <p>In the second part of the state doctoral examination, taking into account the dissertation topic the committee verifies the candidate's ability to place the research into the context of changing general assumptions (e.g. key theories, concepts, directions/schools and individuals) and methodological approaches in geography and related sciences/disciplines. In addition to general knowledge, the examination is particularly intended to verify the following skills: critical thinking, explaining the essence of a problem, distinguishing meaning, presenting arguments, placing a problem in a broader context, general and specific differentiation, presenting relevant empirical examples, and drawing and formulating general conclusions.</p>
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<p>Social Geography and Regional Development</p>	<p>The state doctoral examination consists of two parts:</p> <ol style="list-style-type: none">1) Theoretical/methodological discussion of dissertation,2) Examination in social geography and regional development, or particular subject areas:<ol style="list-style-type: none">2a) Theoretical questions in social geography or theories of regional development. <p>Doctoral students enrolled before October 1st, 2014 also select two of the following subject areas:</p> <ol style="list-style-type: none">2b) Geography of production, geography of non-productive sectors, geography of populations and settlements, historical and cultural geography,2c) Regional politics and regional planning, geography of cities and land use planning, rural geography and environmental protection. 2c subject areas may also include selections from subject areas 2b) and 2c) of the Regional and Political Geography study programme). <p>Doctoral students enrolled after October 1st, 2014 also select one of the following subject areas: Economic geography, geography of cities, geography of populations and settlement, geography of health, migrations studies, historical and cultural geography, regional development and regional politics, with respect to the dissertation topic and completed partial study requirements set forth in the individual plan. (Recommended study materials are listed in SIS for individual subjects "for PGS").</p> <p>In the first part of the state doctoral examination the doctoral student presents the dissertation to the committee, as well as the focus of research, the theoretical and methodological points of departure, and the current state of progress on the dissertation (max. 15 minutes, ppt presentation). This is followed by a discussion.</p> <p>In the second part of the state doctoral examination, taking into account the dissertation topic the committee verifies the candidate's ability to place the research into the context of changing general assumptions (e.g. key theories, concepts, directions/schools and individuals) and methodological approaches in geography and related sciences/disciplines. In addition to general knowledge, the examination is particularly intended to verify the following skills: critical thinking, explaining the essence of a problem, distinguishing meaning, presenting arguments, placing a problem in a broader context, general and specific differentiation, presenting relevant empirical examples, and drawing and formulating general conclusions.</p>
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<p>Theoretical and Evolutional Biology</p>	<p>The candidate must demonstrate broad knowledge of the field as well as detailed knowledge in the area of specialization. This is done by speaking about two or three selected topics, and especially by engaging in an academic debate with members of the committee. The emphasis is put on methodological problems and issues of interpretation. The candidates are expected to demonstrate outstanding orientation in the issues examined, to think creatively, and to be able to conduct independent scientific work to successfully complete the doctoral project.</p> <p>The topics for presentation and discussion are selected by the committee with a relation to the focus of the candidate's work, while not directly duplicating the dissertation topic.</p>
<p>Developmental and Cell Biology*</p>	<p>The state doctoral examination is oral and thematically divided into questions on molecular and cell biology, developmental biology and methodological approaches. The doctoral examination is open to the public and is conducted in the form of an academic discussion with members of the committee, where the candidate must demonstrate a thorough knowledge of the subject of interest and other topics and methodological or conceptual problems related to his/her research. The candidates are expected to demonstrate outstanding orientation in the issues examined, and to be able to think creatively and conduct independent scientific work.</p>
<p>Zoology</p>	<p>The state doctoral examination is open to the public and is conducted in the form of an academic discussion with members of the committee, where the candidate must demonstrate a thorough knowledge of the subject of interest and other topics and methodological or conceptual problems related to own research. The candidates are expected to demonstrate outstanding orientation in the issues examined, to think creatively, and to be able to conduct independent scientific work to successfully complete the doctoral project.</p> <p>The discussion generally takes into account</p> <ul style="list-style-type: none"> (a) the conceptual foundations of the doctoral work and any eventual modifications during the course of research (b) the general methodology and related approaches and conceptual relationships of the topic and any alternatives (c) the specific zoological attributes of higher taxons to which the project pertains.