**State Doctoral Examination, Its Course and Requirements for Doctoral Students**

*DSP Molecular and Cellular Biology, Genetics and Virology*

Doctoral students must apply for their SDE **during the third year of their study at the latest**. In case the first attempt to pass this examinaton is not successful, the second attempt must be made during the academic year following the first SDE attempt at the latest (*only two attempts at passing the SDE are allowed*). Students of the First Faculty of Medicine must not only register for the SDE by the end of the 3rd year of study but also complete it (*according to the faculty's internal regulations*).

Before submitting the application form for the SDE (*it must be oficially submitted in the printed and signed form to the respective administrative department dealing with doctoral studies!*), the doctoral student has to **successfully pass at least one study duty included in the Individual Curriculum as required by the Subject Area Board** (*other duties included in the Individual Curriculum must be fulfilled before the end of the study, i.e. before submitting doctoral thesis and the application for its defence*). Doctoral students registered at the First Faculty of Medicine have to fulfill an additional condition prior to applying for their SDE: the English language certificate at a certain level. Doctoral students registered at the Third Faculty of Medicine also have to fulfill some additional conditions during their first year of the study. However, the Subject Area Board does not require students to be authors or co-authors of any IF papers prior to their SDE.

The SDE consists of an **oral examination** focused on student´s knowledge on two subjects which are personalized in accordance with the respective topic of the doctoral thesis. Students of the Faculty of Science state these two subjects directly at the application form for the SDE, students of the Faculties of Medicine do not.

**The first subject of the SDE** is selected **fully by the student** and should be **related to the topic of doctoral thesis.** This subject **must be approved by the respective faculty co-ordinator** (*see below*) prior to the student application for the SDE (*i.e., the co-ordinator must be contacted and must approve of the subject proposed by the student prior to any official submission of the application form!*). It is best if the student proposes to the co-ordinator 2-3 such subjects (*in the order of preference by the student*); however, the subject cannot be the direct title of doctoral thesis and should not be focused on a too specific topic! (*i.e., it is not acceptable to call your subject, e.g., „The role of modifications of the protein AAA occurring at amino acid BBB in the regulation of the signalling pathway CCC in relation to DNA damage reparation in the kidneys of naked mole-rats“. However, it is quite acceptable for your subject to be, e.g., „Cell signalling and its regulation“, „DNA damage and reparation“, „Protein modifications“, etc. See the end of this file for some suggestions*).

**The second subject of the SDE** is partly **obligatory**: the student must choose either Molecular Biology, Cellular Biology, Genetics or Virology.

The length of the SDE is usually approximately one hour. At its beginning the studentgives a **short presentation about his/her doctoral project** (*it is usual to prepare and present a**ppt, pptx, pdf file*). This presentation must include an information on the current theoretical knowledge of the respective scientific topic including its more general context (*it should be evident that the student has already read at least some relevant papers on his/her topic and has a good theoretical background*), a main goal of the project (and its partial goals, if any), hypotheses that are being tested, brief information on the methodical approaches that the student utilizes or wants to utilize in the future, and it is also possible to briefly present the most important results already obtained. However, the length of the whole presentation **should not much exceed 15 min** (maximum – only in exceptional cases – 18 min)!

After this presentation, the SDE continues with the questions by the examination committee pertaining to the **first, fully elective subject**; this is the most important part of the SDE (*and it usually takes the majority of the time set for the SDE*). The questions can be related directly to the student´s presentation, to his/her publications on the respective topic (*if some are already published*), to information available to the Subject Area Board during yearly assessments of the Individual Curriculum, and they ofter extend to the full/wider scope of the selected subject (*although most members of the committee will usually try to ask about something more-or-less related to the doctoral project*). During this part of the SDE, the student must display advanced and detailed knowledge on the current state of scientific topics directly related to his/her area of specialisation, including knowledge on various methodical approaches related to their research (their principles, various advantages and disadvantages) and topics reaching into associated research areas. It is expected that doctoral students will clearly demonstrate their ability to comprehend the essence of their scientific problem within broader contexts, possess good knowledge of what they have presented at the start of the SDE or what is stated in their ISP and the texts of their annual ISP assessments, and, above all, demonstrate their capacity for creative thinking during this part of the examination.

If that is not the case, students are assessed regarding their knowledge in **the second, partly obligatory subject of the SDE**. Here, the students should have a good general theoretical background in the selected subject, at least at the level of the M.Sc. graduates of the Faculty of Science, Charles University (the Master Study Programme Genetics, Molecular Biology and Virology). The required knowledge can be found within the syllabi of the specific lectures (*the literature recommended for the study is given for these lectures directly in the SIS; however, it mostly comprizes of the main, most common university textbooks for the respective scientific field, pdfs of lecture presentations, etc.*).

In case of **Molecular Biology** this knowledge is covered by lectures [Essentials in Molecular Biology](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB140P71), [Molecular Biology](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB140P41), [Molecular Biology](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB140P44) of RNA and [Molecular and Cell Biology Methods](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB140S79).

In case of **Cellular Biology** this knowledge is covered by lectures [Biology of the Cell](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB150P31), [Physiology of the Cell](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB150P22) and [Structure and Function of Biological Membranes](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB150P42).

In case of **Genetics** this knowledge is covered by lectures [Genetics](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB140P17), [Human Genetics](https://is.cuni.cz/studium/predmety/eng/index.php?do=predmet&kod=MB140P07) and [Epigenetics](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB150P85).

In case of **Virology** this knowledge is covered by lectures [Virology – Systems on Molecular Level](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB140P81), [Viruses and the Immunity System of the Host](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB140P72), [Progress in Molecular Virology](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB140P82), [Viruses and Tumours](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB140P87), and either [Patogenesis, Epidemiology and Diagnostics of Selected Human and Animal Diseases](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB140P85)  or [Molecular and Immunologic Mechanism of Viral Pathogenesis](https://is.cuni.cz/studium/eng/predmety/index.php?do=predmet&kod=MB140P91)

In case a student does not pass the SDE successfully on his/her first attempt, he/she may choose different topics for the second attempt than those selected for the first attempt (*the same rules apply to this second attempt ar for the first attempt, see above*).

**Co-ordinators for the respective faculties:**

* Faculty of Science = Assoc. Prof. RNDr. Dana Holá, Ph.D. dana.hola@natur.cuni.cz
* First Faculty of Medicine = Assoc. Prof. MUDr. Milada Kohoutová, CSc. milada.kohoutova@lf1.cuni.cz
* Second Faculty of Medicine = Prof. MUDr. Eva Froňková, Ph.D. eva.fronkova@lfmotol.cuni.cz
* Third Faculty of Medicine = Prof. RNDr. Jan Kovář, DrSc. jan.kovar@lf3.cuni.cz

**Examples of the Acceptable First Subject of the SDE** (*based on the SDEs that took place recently; however, you do not have choose only from the list below, these are only some examples approved by the respective co-ordinator and you can propose to her/him other subject. The only condition is that it has to be relevant to your own work and that it cannot be a too specific topic*):

* Bioinformatics / bioinformatics analysis of gene expression
* Biological membranes – structure and function
* Cellular energetics and metabolism / Energy metabolism
* Cellular response to DNA damage
* Cellular signaling in eukaryotes
* Cellular signaling in response to viral infection
* Clinical genetics
* CNS diseases
* Cytogenetics
* Cytoskeleton – its regulation and dynamics
* Environmental microbiology
* Epidemiology and diagnosis of viral diseases
* Epigenetics
* Forensic genetics
* Gene expression and its regulation (*can be narrowed to eukaryotes, bacteria, etc.*)
* Gene therapy
* Genetic basis of diseases in humans
* Genetic determination of sex in eukaryotes
* Genetic engineering
* Genome integrity and its maintenance
* Hematopoiesis
* Hybrid sterility
* Immunology
* Innate immunity
* Intracellular transport in eukaryotes
* Lipid metabolism
* Mammalian reproductive system
* Mechanisms of neurodegeneration
* Membrane receptors and their various types
* Methods of protein structure analysis
* Methods/systems of protein expression and purification
* Molecular basis of cancer development
* Molecular basis of circadian rhythms
* Molecular genetics of solid tumors
* Molecular mechanisms of apoptosis
* Molecular neurobiology
* Molecular oncology
* Non-coding RNA (*can be narrowed to small or long ncRNA*)
* Oncogenes
* Oncology
* Parental imprinting
* Plant genetics
* Post-transcriptional modifications of mRNA
* Prenatal diagnostics
* Protein degradation and proteotoxic stress
* Proteolysis – mechanisms, regulation, and functions
* Proteomics
* Quality control of proteins
* Regulation of the cell cycle
* Regulatory mechanisms of lipid metabolism
* Response of tumor cells to DNA damage
* RNA interference
* RNA viruses
* Role of non-coding RNAs in carcinogenesis
* Sequencing of nucleic acids
* Structure and function of non-coding RNAs
* Structure and properties/functions of nucleic acids
* Transcription and its regulation (*can be narrowed to eukaryotes, bacteria, etc.*)
* Translation and its regulation (*can be narrowed to eukaryotes, bacteria, etc.*)
* Transport in yeast cells
* Tumor genetics / Oncogenetics / Genetics of tumors
* Tumor microenvironment
* Tumor resistance
* Tumor therapy / cancer treatment
* Vertebrate embryology
* Virus interactions with host cells
* Virus replication
* Viruses and the immune system
* Viruses and tumors
* Wound healing process
* Yeast biology