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Federal State Budget Educational Institution
of Higher Education
Pacific State Medical University
of the Ministry of Health of the Russian Federation

APPROVED BY

Head of the Department
of Biology, Botany and Ecology
_____ / Zenkina V.G./
"11th" of April 2025

SUBJECT GUIDE FOR TEACHERS AND STUDENTS FOR

Б1.О.06 Biology

(Name of discipline)

Specialty	**31.05.01 General Medicine for international students (in English)** (code, name)
Degree	Specialist's degree
Profile	02 "Healthcare" (in the field of providing primary health care to the population in medical organizations: polyclinics, outpatient clinics, inpatient/outpatient facilities of the municipal health care system)
Mode of study	**Full-time**
Period of mastering the BEP	**6 years** (nominal length of study)
Department	of Biology, Botany and Ecology

Vladivostok, 2025

Subject guide for teachers and students for **Б1.О.06 Biology** is based on:

1) Federal State Educational Standard of Higher Education for the specialty approved by the Order No. 988 of Ministry of Science and Higher Education of the Russian Federation
dated August 12, 2020.

2) Curriculum for the specialty 31.05.01 General Medicine for international students (in English), profile 02 "Healthcare" (in the field of providing primary health care to the population in medical organizations: polyclinics, outpatient clinics, inpatient/outpatient facilities of the municipal health care system),
approved by the Academic Council of FSBEI HE PSMU of the Ministry of Health of Russia Report No. 8/24-25 dated March 31, 2025.

Subject guide for teachers and students for the discipline were developed by the writing team of the Department of Biology, Botany and Ecology of the FSBEI HE PSMU of the Ministry of Health of Russia, under the guidance of head of the department Candidate of Medical Sciences, Associate Professor Zenkina V.G.

Developed by:

Head of Department	Candidate of Medical Sciences, Associate Professor	Zenkina V.G.
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1. GENERAL PROVISIONS

Subject guide for **Б1.О.06 Biology** is a set of recommendations and explanations that facilitate to optimal organization of mastering this discipline.

Regular analysis of lecture materials and work with end-of-the-text questions are necessary for better understanding of the material and systematization of knowledge of **Б1.О.06 Biology**. Particular attention should be paid to emerging questions, confusing terms, and conflicts of points of view during the independent review of the lecture material. If necessary, a student should contact the teacher for advice. Lecture material streamlines students' thinking, while practical classes provide deeper insight into the material of the discipline.

Special attention should be paid to the content of the main provisions and conclusions, explanation of phenomena and facts, and clarification of the practical application of theoretic aspects of topic when preparing for a practical class. During this process students should aim to understand and remember the main provisions of the material under consideration, examples provided, as well as understand the illustrative material.

Collections of assessment tools are used to organize independent study of topics (questions) of the discipline.

Independent work of students is facilitated by the following:

1. availability and accessibility of the necessary educational and reference material;
2. a system of regular quality control of completed independent work;
3. availability of teacher's advice.

Subject guides for self-study are presented as literary sources and visual aids (portfolios for different sections of the discipline, microscope slides, subject guides for the students). Subject guides for independent work of students include a list of library resources of the educational institution and other materials accessible to students.

Independent work is a type of in-person extracurricular work of teachers and students of **Б1.О.06 Biology**. Control of independent work is conducted by the leading teacher. Evaluation of independent work results is taken into account when conducting interim examination of students throughout the **Б1.О.06 Biology** course.

Continuous assessment during the **Б1.О.06 Biology** course is implemented in order to check indicators of achieving competencies, to stimulate students' academic work, and improve methods of mastering new knowledge. Continuous assessment during the **Б1.О.06 Biology** course is conducted during the semester to assess all types and sections of the academic discipline that encompass the competencies developed by the discipline: classroom questioning, conducting discussions, working with tests, writing library-research papers, working with mini cases studies, working with portfolios on cytology, parasitology, and genetics, as well as making crosswords. Continuous assessment of students' knowledge and results of their preparation for practical classes is conducted during every class session.

Interim assessment aims to determine the level of mastery of competency indicators. It is conducted in the graded test format after the student has mastered all sections of **Б1.О.06 Biology** and takes into account learning outcomes for all types of student work over the entire period of mastering the **Б1.О.06 Biology** course.

Time allotted for interim assessment is indicated in the schedule.

Assignments given during practical classes, as well as assignments aimed to prepare students for continuous and interim assessment, are included in the collection of assessment tools for **Б1.О.06 Biology**. If necessary, students should contact the teacher for advice. It is necessary to thoroughly think over questions that need clarification before seeking teacher's advice.

2. SUBJECT GUIDES FOR LECTURE CLASSES

Table 1. Subject Guides for Б1.О.06 Biology Lectures

Topic No.1 Biology in the system of medical sciences. Biology of the eukaryotic cell. Cell proliferation	
Duration of the lecture (in academic hours):	2
Purpose of the lecture: 1. tell students about lifeforms on Earth, properties of the living matter, cell structure and function as a basic living system, functions of individual cell components, processes of cell replication and adaptation to the environment; 2. define relevant terminology: life, chromosomes, karyotype and ideogram, mitosis, meiosis, gametogenesis, fertilization; 3. examine the methods of identifying the stages of mitosis, meiosis, gametogenesis, and fertilization process.	
Lecture plan, order of presentation of its sections: - Place of biology in the system of medical sciences - Lifeforms and properties of the living matter - Biology of the eukaryotic cell (cell surface, cytoplasm, nucleus) - Chromosome morphology. Karyotype and ideogram - Mitosis, stages of mitosis. Biological significance - Cytogenetic characteristic of meiosis - Gametogenesis - Fertilization and its stages	
Recommended reading: 1. Биология: учебник: в 2 т. В.Н. Ярыгин М.: Издательство Юрайт, 2025. - 823 с. - URL: https://urait.ru/ 2. Учение о клетке (учебное пособие) Зенкина В.Г., Солодкова О.А., Божко Г.Г. Владивосток: Медицина ДВ. 2022. – 168 с. URL: http://books-up.ru/ URL: https://e.lanbook.com	
Topic No.2 Patterns of trait inheritance at the organism and cellular levels	
Duration of the lecture (in academic hours):	2
Purpose of the lecture: 1. tell students about patterns of trait inheritance and variability, different types of interaction of allelic and non-allelic genes; 2. define relevant terminology: gene, genotype, phenotype, linkage group; 3. examine the types of interaction of allelic and non-allelic genes.	
Lecture plan, order of presentation of its sections: - History of genetics - Mendel's laws of inheritance - Types of interaction between genes - Genetic markers found in blood - Morphological chart of X and Y chromosomes - Inheritance of sex-linked traits - Genetic linkage. Chromosomal theory of inheritance	
Recommended reading: 1. Биология: учебник: в 2 т. В.Н. Ярыгин М.: Издательство Юрайт, 2025. - 823 с. - URL:	

https://urait.ru/
2. Генетика человека (учебное пособие) Зенкина В.Г., Солодкова О.А., Божко Г.Г. Владивосток: Медицина ДВ. 2019. – 93 с. URL: https://www.books-up.ru/

Topic No.3 Parasitism phenomenon. Medical protozoology

Duration of the lecture (in academic hours):	2

Purpose of the lecture:
1. tell students about aspects of anatomy of parasites at all stages of development, relationships within the parasite-host system, taxonomy principles, and aspects of life cycles of parasites;
2. define relevant terminology: parasitism, natural focal diseases, vector-borne disease, intermediate and definitive (final) host, reservoir host, invasion stage;
3. examine the aspects of methods of parasitic protozoa infection and focus on the prevention methods in a person and in society.

Lecture plan, order of presentation of its sections:
- Subject of medical parasitology
- Types of interspecies biotical relationships
- Classification of parasitism and parasites
- Natural focal and vector-borne diseases
- Parasitic protozoa

Recommended reading:

Topic No.4 Developmental biology

Duration of the lecture (in academic hours):	2

Purpose of the lecture:
1. tell students about patterns of ontogeny on cellular and supracellular levels, changes that cells and cell complexes undergo during embryonic development;
2. define relevant terminology: blastula, gastrula, neurula, cleavage, gastrulation, differentiation, embryonic induction;
3. examine the aspects of stages of human ontogeny, focus on the temporary embryonic organs, critical periods of development, and teratogens (teratogenic factors).

Lecture plan, order of presentation of its sections:
- Definition of ontogeny
- Theories, types, forms, periods of ontogeny
- Molecular and genetic processes of differentiation
- Interaction between parts of a developing embryo
- Critical periods of development

Recommended reading:
1. Биология: учебник: в 2 т. В.Н. Ярыгин М.: Издательство Юрайт, 2025. - 823 с. - URL: https://urait.ru/
2. Генетика человека (учебное пособие) Зенкина В.Г., Солодкова О.А., Божко Г.Г. Владивосток: Медицина ДВ. 2019. – 93 с. URL: https://www.books-up.ru/

3. SUBJECT GUIDES FOR PRACTICAL CLASSES

Table 2. Subject Guides for Practical Б1.О.06 Biology Classes

Topic No.1 Biology of the eukaryotic cell	
Duration of the practical class (in academic hours):	4
Purpose of the practical class: 1. consolidate acquired knowledge of structure and function of living systems on cellular level; 2. during the discussion, outline the main life forms and their structure; 3. thoroughly go over definitions and concepts of prokaryotes and eukaryotes; 4. study patterns of structural and functional organization of the cell; 5. develop concept of the cell as a unit of biological activity, which is supported by the network of interlinked and organized in the time and space metabolic processes confined to specific intercellular structures.	
Practical classes requirements: classrooms equipped with multimedia equipment, blackboards, laboratory equipment, subject guides for the discipline, visual aids, and microscope slides.	
Independent work of the student: writing a research paper, preparation of a report on the lecture, working with study materials, working with mini-cases and case studies, analysing microscope slides.	
Methods of evaluation of acquired knowledge and skills: discussions, quizzes, tests.	
Recommended reading: 1. Биология: учебник: в 2 т. В.Н. Ярыгин М.: Издательство Юрайт, 2025. - 823 с. - URL: https://urait.ru/ 2. Учение о клетке (учебное пособие) Зенкина В.Г., Солодкова О.А., Божко Г.Г. Владивосток: Медицина ДВ. 2022. – 168 с. URL: http://books-up.ru/ URL: https://e.lanbook.com	
Topic No.2 Morphology and function of interphase and mitotic nuclei	
Duration of the practical class (in academic hours):	4
Purpose of the practical class: 1. consolidate acquired knowledge on the morphology of eukaryotic cell nucleus, phases of splitting of the nucleoplasm of the parent cell between the daughter cells; 2. during the discussion, outline the main structural and functional changes of the cell over the course of its lifecycle; 3. thoroughly go over definitions and concepts of nucleus, lifecycle, mitotic cycle, interphase, endomitosis, amitosis; 4. study patterns of chemical and structural organization of chromosomes over the course of the lifecycle of the cell; 5. develop concept of the eukaryotic cell nucleus as a structural and functional component, and of patterns of the lifecycle of the cell.	
Practical classes requirements: classrooms equipped with multimedia equipment, blackboards, laboratory equipment, subject guides for the discipline, visual aids, and microscope slides.	
Independent work of the student: writing a research paper, preparation of a report on the lecture, working with study materials, working with mini-cases and case studies, analysing microscope	

slides.
Methods of evaluation of acquired knowledge and skills: discussions, quizzes, tests, working with case studies.
Recommended reading: 1. Биология: учебник: в 2 т. В.Н. Ярыгин М.: Издательство Юрайт, 2025. - 823 с. - URL: https://urait.ru/ 2. Учение о клетке (учебное пособие) Зенкина В.Г., Солодкова О.А., Божко Г.Г. Владивосток: Медицина ДВ. 2022. – 168 с. URL: http://books-up.ru/ URL: https://e.lanbook.com
Topic No.3 Parasitism phenomenon. Medical protozoology

Duration of the practical class (in academic hours):	4

Purpose of the practical class: 1. consolidate acquired knowledge on parasitism and parasitic protozoa; 2. during the discussion, outline lifecycles of parasitic protozoa; 3. thoroughly go over definitions and concepts of definitive (final) host, reservoir host, intermediate host, invasion stage; 4. study patterns of parasites' structure, aspects of relationships within the parasite-host system; 5. develop concept of parasitology as a complex science that studies the parasites of the human and develops the science-based methods of combating them, as well as methods of diagnosis, treatment, and prevention of parasitic invasions.
Practical classes requirements: classrooms equipped with multimedia equipment, blackboards, laboratory equipment, subject guides for the discipline, visual aids, and microscope slides.
Independent work of the student: writing a research paper, preparation of a report on the lecture, working with study materials, analysing microscope slides.
Methods of evaluation of acquired knowledge and skills: discussions, quizzes, tests, working with mini cases and case studies.
Recommended reading: 1. Биология: учебник: в 2 т. В.Н. Ярыгин М.: Издательство Юрайт, 2025. - 823 с. - URL: https://urait.ru/ 2. Медицинская арахноэнтомология: учеб. пособие Г.Г. Божко, В.Г. Зенкина, О.А. Солодкова, А.А. Агибалова Владивосток; Медицина ДВ, 2020. – 137 с. URL: https://books-up.ru
Topic No.4 Developmental biology

Duration of the practical class (in academic hours):	4

Purpose of the practical class: 1. consolidate acquired knowledge on the stages of ontogeny, aspects of their progression, and possible abnormalities; 2. thoroughly go over definitions and concepts of blastula, gastrula, neurula, cleavage, gastrulation, differentiation, embryonic induction, temporary embryonic organs, critical periods of development; 3. study patterns of embryonic development;

4. develop concept of ontogeny as a combination of interlinked and predetermined chronological events, that occur consistently over the course of the lifecycle of an organism.
Practical classes requirements: classrooms equipped with multimedia equipment, blackboards, laboratory equipment, subject guides for the discipline, visual aids, and microscope slides.
Independent work of the student: writing a research paper, preparation of a report on the lecture, working with study materials, analysing microscope slides.
Methods of evaluation of acquired knowledge and skills: discussions, quizzes, tests, working with case studies.
Recommended reading: 1. Биология: учебник: в 2 т. В.Н. Ярыгин М.: Издательство Юрайт, 2025. - 823 с. - URL: https://urait.ru/ 2. Генетика человека (учебное пособие) Зенкина В.Г., Солодкова О.А., Божко Г.Г. Владивосток: Медицина ДВ. 2019. – 93 с. URL: https://www.books-up.ru/

4. GUIDELINES FOR CONTINOUS AND INTERIM ASSESSMENT

Table 3. Guidelines for Conducting Continuous and Interim Assessment during the Б1.О.06 Biology Course

Type of assessment	Assessment format
Continuous assessment	- conducting and evaluating oral or written quizzes during lectures and practical classes; - assessment and evaluation of completion and results of assignments given during practical classes; - assess and evaluate completion and results of individual assignments and exam tasks given during practical classes; - assessment and evaluation of lecture notes quality.
Interim certification	is conducted in graded test format (test on a computer); it allows to assess the development of students' competencies correlating with types of professional activity.

5 ASPECTS OF THE IMPLEMENTATION OF THE COURSE FOR STUDENTS WITH DISABILITIES AND SPECIAL NEEDS

5.1. Availability of accessible environment

For students with disabilities and special needs, if a written application is submitted, lectures and practical classes are carried out taking into account health limitations, individual capabilities and medical status (hereinafter referred to as individual characteristics) of the student. Compliance with the following general requirements is ensured: teaching aids for collective and individual use are provided, required technical assistance is provided by an assistant, buildings and premises where lectures and practical classes are taking place meet accessibility requirements, other arrangements lack of which makes it impossible or difficult to master the discipline are made.

5.2. Compliance with general requirements

When lectures and practical classes are carried out at the written application of the student, the following general requirements are met: lectures and practical classes for students with disabilities and special needs take place at the same location as for students who do not have

disabilities, if this does not cause difficulties for students; an assistant (assistants), who provide(s) students with the necessary technical assistance taking into account individual characteristics of the student, is (are) provided; necessary teaching aids are provided, taking into account individual characteristics of the student.

5.3. Availability of the internal policies and procedures of FSBEI HE PSMU of the Ministry of Health of Russia to students with disabilities in a form accessible to them.

All internal policies and procedures of FSBEI HE PSMU of the Ministry of Health of Russia concerning the discipline are made available to students with disabilities in a form accessible to them.

5.4. Increase in the duration of interim assessment of students with disabilities and special needs in relation to the established duration

Format of the interim assessment of academic performance within the scope of the discipline for students with disabilities and special needs is selected taking into account individual characteristics (orally, by writing on paper, by typing on a computer, as a test, etc.). The duration of the interim assessment in relation to the established duration is increased at the written application of the student with disabilities. Time limit for the student's preparation for the test is increased by at least 0.5 hours

6. STAFFING REQUIREMENTS OF THE DISCIPLINE

Academic teaching personnel that ensure the implementation of the discipline education process meet the requirements of the Federal State Educational Standard of Higher Education for the 31.05.01 General Medicine specialty; list of the aforementioned personnel is available on the website of the educational organization.