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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
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"1st" of April 2025

SUBJECT GUIDE FOR TEACHERS AND STUDENTS FOR

Б1.О.13 Microbiology, virology

(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 Microbiology, Dermatovenereology and Cosmetology

Vladivostok, 2025

Subject guide for teachers and students for **Б1.О.13 Microbiology, virology** 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 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 **Б1.О.13 Microbiology, virology** was developed by the writing team of the Department of Microbiology, Dermatovenereology and Cosmetology of the FSBEI HE PSMU of the Ministry of Health of Russia, under the guidance of the head of the department, Doctor of Medical Sciences Zaytseva E.A..

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1. GENERAL PROVISIONS

Subject guide for **Б1.О.13 Microbiology, virology** 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.13 Microbiology, virology**. 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 of **Б1.О.13 Microbiology, virology**.

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. 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.13 Microbiology, virology**. 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 **Б1.О.13 Microbiology, virology** course.

Continuous assessment during **Б1.О.13 Microbiology, virology** 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 **Б1.О.13 Microbiology, virology** 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, working with tests, writing research papers, and other types of independent and classroom work. 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 exam format after the student has mastered all sections of **Б1.О.13 Microbiology, virology** and takes into account learning outcomes for all types of student work over the entire period of mastering **Б1.О.13 Microbiology, virology** 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.13 Microbiology, virology**. 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.13 Microbiology, virology** Lectures

Topic No.1 The main historical stages of the development of microbiology and virology. Systematics and principles of classification of microorganisms. Morphology and structure of the main forms of microorganisms	
Duration of the lecture (in academic hours):	2
Purpose of the lecture: 1. tell students about the historical stages of microbiology's development and the role of Russian and foreign scientists in its advancement; 2. explain the concepts of microorganism taxonomy and classification; 3. define the morphology and structure of the main forms of microorganisms.	
Lecture plan, order of presentation of its sections: - Microbiology as a science: the subject of discipline - Historical stages in the development of microbiology - Contributions of scientists to the development of microbiology - Medical microbiology: objectives of medical microbiology - Methods of microbiological diagnostics. Taxonomy and systematics of microorganisms - Classification and morphology of bacteria. Structure of basic and temporary bacterial formations	
Recommended reading: 1. Medical Microbiology, Virology, Immunology : textbook. Vol. 1 / ed. by V. V Zverev, M. N. Boichenko.M.: GEOTAR-Media, 2020. - 384 p. URL: http//www.studentlibrary.ru 2. Medical Microbiology, Virology, Immunology : textbook : Vol. 2. / ed. by V. V. Zverev, M. N. Boichenko. M.: GEOTAR-Media, 2020. - 392 p. URL: http//www.studentlibrary.ru 3. Microbiology, virology, immunology : textbook / E. A. Mikhailova, L. M. Aznabayeva, I. E. Lyashenko [et al.]. M.: GEOTAR-Media, 2024. - 560 p. URL: http//www.studentlibrary.ru	
Topic No.2 Physiology of microorganisms: nutrition, respiration, reproduction	
Duration of the lecture (in academic hours):	2
Purpose of the lecture: 1. tell students about the chemical structure of bacteria, the transport of substances, bacterial enzymes, and the regulation of bacterial metabolism, as well as the growth and reproduction of microorganisms; to classify nutrient media by purpose and use; 2. define bacterial physiology, nutrient media, including chromogenic agars, and the method for isolating pure cultures; 3. examine the purpose and use of nutrient media and methods for identifying aerobic and anaerobic bacteria.	
Lecture plan, order of presentation of its sections: - Chemical composition of microbial cells - Microbial nutrition. Metabolism - Nutrient media. Classification - Microbial respiration (MOR) - Methods for creating anaerobic conditions - MOR reproduction, bacterial growth phases, growth assessment - Isolation of pure culture (stages, identification parameters)	

Recommended reading:

1. Medical Microbiology, Virology, Immunology : textbook. Vol. 1 / ed. by V. V Zverev, M. N. Boichenko.M.: GEOTAR-Media, 2020. - 384 p. URL: http//www.studentlibrary.ru
2. Medical Microbiology, Virology, Immunology : textbook : Vol. 2. / ed. by V. V. Zverev, M. N. Boichenko. M.: GEOTAR-Media, 2020. - 392 p. URL: http//www.studentlibrary.ru
3. Microbiology, virology, immunology : textbook / E. A. Mikhailova, L. M. Aznabayeva, I. E. Lyashenko [et al.]. M.: GEOTAR-Media, 2024. - 560 p. URL: http//www.studentlibrary.ru

Topic No.3 Morphostructural organization and physiology of viruses, features of their reproduction, cultivation methods. Bacteriophages

Duration of the lecture (in academic hours):	2

Purpose of the lecture:
1. tell students about morphology and genetics of viruses;
2. define viral mechanisms of their pathogenesis;
3. examine the methods of viral identification.

Lecture plan, order of presentation of its sections:

- Morphology and genetics of different viruses
- Mechanisms of viral processes
- Signs and symptoms of viral infections
- Identification methods of viral infections. Antiviral treatment

Recommended reading:

1. Medical Microbiology, Virology, Immunology : textbook. Vol. 1 / ed. by V. V Zverev, M. N. Boichenko.M.: GEOTAR-Media, 2020. - 384 p. URL: http//www.studentlibrary.ru
2. Medical Microbiology, Virology, Immunology : textbook : Vol. 2. / ed. by V. V. Zverev, M. N. Boichenko. M.: GEOTAR-Media, 2020. - 392 p. URL: http//www.studentlibrary.ru
3. Microbiology, virology, immunology : textbook / E. A. Mikhailova, L. M. Aznabayeva, I. E. Lyashenko [et al.]. M.: GEOTAR-Media, 2024. - 560 p. URL: http//www.studentlibrary.ru

Topic No.4 Environmental microbiology. Normal human microbiota. Forms of relationships between microbes and other biological objects. Biofilms

Duration of the lecture (in academic hours):	2

Purpose of the lecture:
1. tell students about the interactions between microorganisms, the formation of normal human microbiota, and its relationship to various pathological processes in the microorganism;
2. define normal human microbiota and the concept of biofilm;
3. examine the formation of biofilm and its importance in medicine.

Lecture plan, order of presentation of its sections:

- Basic concepts of ecology and the role of bacteria in human life
- Forms of interaction between microorganisms. The role of normal microbiota in the vital functions of a macroorganism
- Biofilms. Biofilm formation in bacteria

Recommended reading:

1. Medical Microbiology, Virology, Immunology : textbook. Vol. 1 / ed. by V. V Zverev, M. N. Boichenko.M.: GEOTAR-Media, 2020. - 384 p. URL: http//www.studentlibrary.ru
2. Medical Microbiology, Virology, Immunology : textbook : Vol. 2. / ed. by V. V. Zverev, M. N. Boichenko. M.: GEOTAR-Media, 2020. - 392 p. URL: http//www.studentlibrary.ru
3. Microbiology, virology, immunology : textbook / E. A. Mikhailova, L. M. Aznabayeva, I. E. Lyashenko [et al.]. M.: GEOTAR-Media, 2024. - 560 p. URL: http//www.studentlibrary.ru

Topic No.5 Antimicrobial chemotherapeutic agents. Classification. Interaction of antimicrobial chemotherapeutic agents with microorganisms. Mechanisms of bacterial resistance to antimicrobial agents

Duration of the lecture (in academic hours):	2

Purpose of the lecture:
1. tell students about antimicrobial agents, their mechanisms of action on microorganisms, and the development of antimicrobial resistance;
2. define the susceptibility of microorganisms to antimicrobial agents and resistance;
3. examine methods for determining and assessing the susceptibility of microorganisms to antimicrobial agents.

Lecture plan, order of presentation of its sections:
- Antimicrobial medications. Classification. Mechanisms of action on bacterial cell structure
- Development of antibiotic resistance in bacteria
- Methods for determining the sensitivity of microorganisms to antimicrobial drugs

Recommended reading:
1. Medical Microbiology, Virology, Immunology : textbook. Vol. 1 / ed. by V. V Zverev, M. N. Boichenko.M.: GEOTAR-Media, 2020. - 384 p. URL: http//www.studentlibrary.ru
2. Medical Microbiology, Virology, Immunology : textbook : Vol. 2. / ed. by V. V. Zverev, M. N. Boichenko. M.: GEOTAR-Media, 2020. - 392 p. URL: http//www.studentlibrary.ru
3. Microbiology, virology, immunology : textbook / E. A. Mikhailova, L. M. Aznabayeva, I. E. Lyashenko [et al.]. M.: GEOTAR-Media, 2024. - 560 p. URL: http//www.studentlibrary.ru

Topic No.6 Genetics: heredity and variability of microorganisms. Modern molecular genetic methods in the diagnosis of infectious diseases

Duration of the lecture (in academic hours):	2

Purpose of the lecture:
1. tell students about the stages of the development of genetics as a science;
2. define the concepts of genotype and phenotype, heredity, and variability of microorganisms;
3. examine molecular genetic methods used in clinical practice to diagnose infectious diseases.

Lecture plan, order of presentation of its sections:
- Genetics as a science. The concept of heredity and variability
- Genotype and phenotype of microorganisms
- Forms of microorganism variability
- The practical significance of microorganism variability
- Molecular genetic methods in the diagnosis of infectious diseases

Recommended reading:

1. Medical Microbiology, Virology, Immunology : textbook. Vol. 1 / ed. by V. V Zverev, M. N. Boichenko.M.: GEOTAR-Media, 2020. - 384 p. URL: http//www.studentlibrary.ru
2. Medical Microbiology, Virology, Immunology : textbook : Vol. 2. / ed. by V. V. Zverev, M. N. Boichenko. M.: GEOTAR-Media, 2020. - 392 p. URL: http//www.studentlibrary.ru
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3. SUBJECT GUIDES FOR PRACTICAL CLASSES

Table 2. Subject Guides for Practical **Б1.О.13 Microbiology, virology** Classes

Topic No.6 Environmental microbiology. Forms of interaction between microorganisms. Biofilms and their formation mechanisms. Quorum sensing. Fundamentals of chemoprophylaxis and chemotherapy. Classification of antimicrobial agents, mechanism of action on bacterial cells. Mechanisms of resistance development. Determining the susceptibility of microbes to medications	
Duration of the practical class (in academic hours):	3
Purpose of the practical class: 1. consolidate knowledge acquired during the lecture; 2. during the discussion, outline the forms of interaction between microorganisms; 3. thoroughly go over definitions and concepts of classifications and mechanisms of action of chemotherapeutic agents; 4. study patterns of and processes of biofilm formation and the principles of intercellular communication between microorganisms; 5. study the patterns and mechanisms of drug resistance; 6. develop an understanding of antimicrobial susceptibility testing methods (using disks, E-tests, serial dilutions); as well as methods of working with laboratory equipment and interpreting test results.	
Practical classes requirements: classrooms equipped with multimedia equipment, blackboards, subject guides for the discipline, laboratory equipment.	
Independent work of the student: writing a research paper. Preparing a report on the lecture. Working with study materials.	
Methods of evaluation of acquired knowledge and skills: review of reports, classroom questioning, discussions, tests.	
Recommended reading: 1. Medical Microbiology, Virology, Immunology : textbook. Vol. 1 / ed. by V. V Zverev, M. N. Boichenko.M.: GEOTAR-Media, 2020. - 384 p. URL: http//www.studentlibrary.ru 2. Medical Microbiology, Virology, Immunology : textbook : Vol. 2. / ed. by V. V. Zverev, M. N. Boichenko. M.: GEOTAR-Media, 2020. - 392 p. URL: http//www.studentlibrary.ru 3. Microbiology, virology, immunology : textbook / E. A. Mikhailova, L. M. Aznabayeva, I. E. Lyashenko [et al.]. M.: GEOTAR-Media, 2024. - 560 p. URL: http//www.studentlibrary.ru	

Topic No.7 Genetics and variability of microorganisms. Molecular genetic methods for studying microorganisms. Computer programs for assessing antibiotic resistance (AmRbook, etc.)	
Duration of the practical class (in academic hours):	3
Purpose of the practical class: 1. consolidate knowledge acquired during the lecture; 2. during the discussion, outline key issues in microbial genetics; 3. thoroughly go over definitions and concepts of heredity and microbial variability; and the practical application of this knowledge in practice of a physician; 4. develop the idea of potential of using genetic research methods in infectious pathology and the interpretation of their results.	
Practical classes requirements: classrooms equipped with multimedia equipment, blackboards, subject guides for the discipline, laboratory equipment.	
Independent work of the student: writing a research paper. Preparing a report on the lecture. Working with study materials.	
Methods of evaluation of acquired knowledge and skills: review of reports, classroom questioning, discussions, tests.	
Recommended reading: 1. Medical Microbiology, Virology, Immunology : textbook. Vol. 1 / ed. by V. V Zverev, M. N. Boichenko.M.: GEOTAR-Media, 2020. - 384 p. URL: http//www.studentlibrary.ru 2. Medical Microbiology, Virology, Immunology : textbook : Vol. 2. / ed. by V. V. Zverev, M. N. Boichenko. M.: GEOTAR-Media, 2020. - 392 p. URL: http//www.studentlibrary.ru 3. Microbiology, virology, immunology : textbook / E. A. Mikhailova, L. M. Aznabayeva, I. E. Lyashenko [et al.]. M.: GEOTAR-Media, 2024. - 560 p. URL: http//www.studentlibrary.ru	

4. GUIDELINES FOR CONTINOUS AND INTERIM ASSESSMENT

Table 3. Guidelines for Conducting Continuous and Interim Assessment during **Б1.О.13 Microbiology, virology 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 oral format; 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 for international students (in English)** specialty; list of the aforementioned personnel is available on the website of the educational organization.