
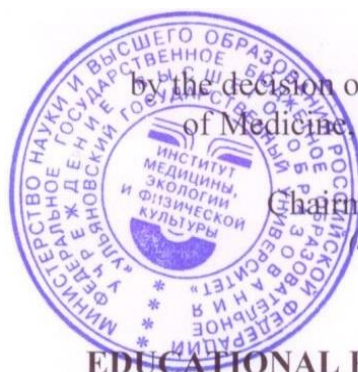


RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		



APPROVED

by the decision of the Academic Council of the Institute
of Medicine, Ecology and Physical Culture of USU

June "19" 2019, № 10/210

Chairman V. I. Midlenko
(signature, signature clarification)

June "19", 2019.

EDUCATIONAL PLAN

Subject:	Microbiology, virology
Faculty	Medical
Department	Department of General and Clinical Pharmacology with Microbiology course
Year	2

Speciality 31.05.01 – General Medicine

Form of education full-time

Date of introduction at the education process at ULSU: « 01 » September 2019.

The program was updated at the department session: protocol № 8 on 17/03 2020.

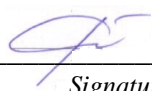

The program was updated at the department session: protocol № 12 on 19/06 2020.


The program was updated at the department session: protocol № on 20 .

The program was updated at the department session: protocol № on 20 .


Information about authors:


Initials	Department abbreviation	Position, Degree, title
Artamonova Marina Nikolaevna	Department of General and Clinical Pharmacology with Microbiology course	Associate professor, PhD in Biological Sciences
Potaturkina Nesterova Natalia Iosifovna	Department of General and Clinical Pharmacology with Microbiology course	Professor, Doctor of Medical Sciences, professor

AGREED	AGREED
Head of the Department of General and Clinical Pharmacology with Microbiology course that implements the discipline	Head of the Graduating Department of Hospital Therapy
 / <u>M. P. Markevich</u> / <i>Signature</i> <i>Name</i> « <u>21</u> » <u>05</u> 2019 г.	 / <u>M. A. Vise-Khripunova</u> / <i>Signature</i> <i>Name</i> « <u> </u> » <u> </u> 2019 г.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

CHANGE SHEET
to the educational plan "Microbiology, Virology"
specialty 31.05.01 “General medicine”

№ п/п	Contents of the change or link to the at- tached text of the change	Name of Head of the Depart- ment	Signature	Date
1	Introduction of changes in subparagraphes 4.2. types of academic workload in paragraph " Subject volume " with writing of application 1	Markevich M.P.		17.03.2020

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		


Application 1

4.1. Subject volume in credits (total) 7



4.2. types of academic workload (in hours) 252


Type of academic workload	Number of hours (form of training -full-time)		
	Total in the plan	Throughout the semesters	
		semester №3	semester № 4
1	2	3	4
Student-Teacher activity	144	72	72
Classes:			
Lectures	36/12*	18	18/12*
Practical classes	108/36*	54	54/36*
Self-study work	72	54	18
Concurrent checking (number and type: a test, a colloquium, a report)	36	-	36
Term thesis			
Types of midterm assessment (an exam, a test)		offset	exam
Total number of hours on the subject	252/48*	126	126/48*

* The number of hours during which teacher works with students in a distance format using online education

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

CHANGE SHEET
to the educational plan "Microbiology, Virology"
specialty 31.05.01 “General medicine”

№ п/п	Contents of the change or link to the attached text of the change	Name of Head of the Department	Signature	Date
1	Introduction of changes in subparagraphes a) list of recommended literature, b) professional databases in paragraph 11 « Educational-methodological and information support of the discipline» with writing of application 1	Markevich M.P.		19.06.2020
2	Introduction of changes in paragraph 13 «Special conditions for students with disabilities of health and disabilities» with writing of application 2	Markevich M.P.		19.06.2020

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

Application 1

11. EDUCATIONAL-METHODOLOGICAL AND INFORMATION SUPPORT OF THE DISCIPLINE

a) List of recommended literature

general

1) Medical microbiology : a guide to microbial infections: pathogenesis, immunity, laboratory investigation and control / ed. by M. R.Barer, W. Irving, A. Swann, N. Perera. - 19th ed. - London : Elsevier, 2018. - 743 p.

2) Medical microbiology, virology and immunology. Lecture notes = Медицинская микробиология, вирусология и иммунология : textbook : учебное пособие для вузов уровня специалитета по направлению подготовки 31.05.01 "Лечебное дело" / М. N. Artamonova [и др.]. - Moscow : GEOTAR-Media, 2020. - 352 p.

additional

1) Microbiology, virology: clinical application cases. General microbiology. Part 1 / М. N. Artamonova, N. I. Potaturkina-Nesterova, I. S. Nemova, A. S. Khitrova; Ulyanovsk State University, Insitute of Medicine, Ecology and Physical culture. - Ulyanovsk : ULSU, 2018. - Текст на англ. Яз.

<http://lib.ulsu.ru/MegaPro/Download/MObject/1372>

educational methodological

1) General microbiology : classification, morphology and ultrastructure of microorganisms : manual for foreign students of medical faculty / М. N. Artamonova, N. I. Potaturkina-Nesterova, I. S. Nemova, A. S. Alekseeva; Ulyanovsk State University. - Ulyanovsk : ULSU, 2016. - На англ. яз.;

<http://lib.ulsu.ru/MegaPro/Download/MObject/6>

2) Artamonova M. N. Microbiology, virology : guidelines for practical classes for foreign students. Part 1 / М. N. Artamonova, N. I. Potaturkina-Nesterova, I. S. Nemova; Ulyanovsk State University, The Institute of Medicine, Ecology and Physical Culture . - Ulyanovsk : ULSU, 2016. - На англ. яз.

<http://lib.ulsu.ru/MegaPro/Download/MObject/5>


3) Artamonova M. N. Microbiology, virology : guidelines for practical classes for foreign students. Part 2 / М. N. Artamonova, N. I. Potaturkina-Nesterova, I. S. Nemova; Ulyanovsk State University, The

Institute of Medicine, Ecology and Physical Culture. - Ulyanovsk : ULSU, 2017.

<http://lib.ulsu.ru/MegaPro/Download/MObject/913>

Agreed:

Гл. библиотекарь ООП НБ УЛГУ / Стадольникова Д. Р. / Стаж / _____

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

b) Professional databases, information and reference systems

1. Электронно-библиотечные системы:

1.1. IPRbooks : электронно-библиотечная система : сайт / группа компаний Ай Пи Ар Медиа. - Саратов, [2020]. – URL: <http://www.iprbookshop.ru>. – Режим доступа: для зарегистрир. пользователей. - Текст : электронный.

1.2. ЮРАЙТ : электронно-библиотечная система : сайт / ООО Электронное издательство ЮРАЙТ. – Москва, [2020]. - URL: <https://www.biblio-online.ru>. – Режим доступа: для зарегистрир. пользователей. - Текст : электронный.

1.3. Консультант студента : электронно-библиотечная система : сайт / ООО Политехресурс. – Москва, [2020]. – URL: http://www.studentlibrary.ru/catalogue/switch_kit/x2019-128.html. – Режим доступа: для зарегистрир. пользователей. – Текст : электронный.

1.4. Лань : электронно-библиотечная система : сайт / ООО ЭБС Лань. – Санкт-Петербург, [2020]. – URL: <https://e.lanbook.com>. – Режим доступа: для зарегистрир. пользователей. – Текст : электронный.

1.5. **Znanium.com** : электронно-библиотечная система : сайт / ООО Знаниум. - Москва, [2020]. - URL: <http://znanium.com>. – Режим доступа : для зарегистрир. пользователей. - Текст : электронный.

1.6. Clinical Collection : коллекция для медицинских университетов, клиник, медицинских библиотек // EBSCOhost : [портал]. – URL: <http://web.a.ebscohost.com/ehost/search/advanced?vid=1&sid=e3ddfb99-a1a7-46dd-a6eb-2185f3e0876a%40sessionmgr4008>. – Режим доступа : для авториз. пользователей. – Текст : электронный.


2. КонсультантПлюс [Электронный ресурс]: справочная правовая система. /ООО «Консультант Плюс» - Электрон. дан. - Москва : КонсультантПлюс, [2020].

3. Базы данных периодических изданий:

3.1. База данных периодических изданий : электронные журналы / ООО ИВИС. - Москва, [2020]. – URL: <https://dlib.eastview.com/browse/udb/12>. – Режим доступа : для авториз. пользователей. – Текст : электронный.

3.2. eLIBRARY.RU: научная электронная библиотека : сайт / ООО Научная Электронная Библиотека. – Москва, [2020]. – URL: <http://elibrary.ru>. – Режим доступа : для авториз. пользователей. – Текст : электронный

3.3. «Grebennikon» : электронная библиотека / ИД Гребенников. – Москва, [2020]. – URL: <https://id2.action-media.ru/Personal/Products>. – Режим доступа : для авториз.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

пользователей. – Текст : электронный.

4. Национальная электронная библиотека : электронная библиотека : федеральная государственная информационная система : сайт / Министерство культуры РФ ; РГБ. – Москва, [2020]. – URL: <https://нэб.рф>. – Режим доступа : для пользователей научной библиотеки. – Текст : электронный.

5. SMART Imagebase // EBSCOhost : [портал]. – URL: [https://ebSCO-smartimagebase.com/?TOKEN=EBSCO-1a2ff8c55aa76d8229047223a7d6dc9c&custid=s6895741](https://ebSCO.smartimagebase.com/?TOKEN=EBSCO-1a2ff8c55aa76d8229047223a7d6dc9c&custid=s6895741). – Режим доступа : для авториз. пользователей. – Изображение : электронные.

6. Федеральные информационно-образовательные порталы:

6.1. [Единое окно доступа к образовательным ресурсам](http://window.edu.ru/) : федеральный портал / учредитель ФГАОУ ДПО ЦРГОП и ИТ. – URL: <http://window.edu.ru/>. – Текст : электронный.

6.2. [Российское образование](http://www.edu.ru) : федеральный портал / учредитель ФГАОУ ДПО ЦРГОП и ИТ. – URL: <http://www.edu.ru>. – Текст : электронный.

7. Образовательные ресурсы УлГУ:

7.1. Электронная библиотека УлГУ : модуль АБИС Мега-ПРО / ООО «Дата Экспресс». – URL: <http://lib.ulsu.ru/MegaPro/Web>. – Режим доступа : для пользователей научной библиотеки. – Текст : электронный.


7.2. Образовательный портал УлГУ. – URL: <http://edu.ulsu.ru>. – Режим доступа : для зарегистр. пользователей. – Текст : электронный.

Agreed:

Зам. начальника УИТТ / Клочкова А. В. / 

position

name

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		


Application 2

13. SPECIAL CONDITIONS FOR STUDENTS WITH DISABILITIES OF HEALTH AND DISABILITIES

If it is necessary, students with disabilities (at the request of the student) may be offered the following options for perceiving information, according their individual psychophysical characteristics:

- for persons with visual impairment: printed information in large print; in the form of an electronic document; in the form of an audio file (translation of training materials into audio format; individual tasks and consultations;
- for persons with hearing impairment: in print; in the form of an electronic document; individual tasks and consultations;
- for persons with disorders of the musculoskeletal system: in print; in the form of an electronic document; in the form of an audio file; individual tasks and consultations.

If it is necessary to use partially or only distance educational technologies in the educational process, the organization of work of teaching staff with students with disabilities and disabled people is provided in the electronic information and educational environment, taking into account their individual psychophysical characteristics.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

1. GOALS AND OBJECTIVES OF DISCIPLINE

The goals of the discipline: the formation of scientific understanding of the role of microorganisms in the occurrence of human infectious diseases in future doctor, mastering of methods for diagnosing diseases of infectious etiology, and measures for prevention the occurrence of diseases among the population with use of preventive and anti-epidemic measures, that will prepare the student for further study of the complex of biomedical, prophylactic and clinical disciplines in the specialty 31.05.31 “General Medicine”.

The process of discipline development «Microbiology, virology» is formation of general professional competence GPC-7.

Tasks of the discipline: in a lecture course are to present scientific data on medical microbiology competently, in an accessible and systematic way, linking them with the diagnosis, treatment and prevention of infectious diseases of various genesis that are relevant for a medical doctor.

Tasks in practical classes are to materialize theoretical knowledge about the causative agents of infectious diseases, methods for their laboratory diagnosis; to master the primary skills that are necessary in the practice of physician (taking samples of biological material, safety measures when working with him, equipment, etc.). During practical classes, the student is taught the skills to apply the basic principles of the organization of medical care in medical organizations and their structural divisions; explaining of the choice of medical antimicrobial drugs for the treatment and prevention of diseases; the formation of skills in the study of scientific literature.

2. PLACE OF THE SUBJECT IN THE STRUCTURE OF BASIC EDUCATIONAL PROGRAM:

The discipline “Microbiology, virology” is referred to basic part (B1.B.18) of GEP of specialty 31.05.01 «General medicine». Discipline is mastered in English.

Mastering the discipline is based on knowledge, skills and abilities formed by the previous disciplines that include learning of Physics, Mathematics, Medical IT, Chemistry, Biology, and Biochemistry.

Studying the discipline "Microbiology, virology" is preceding subject for the learning of the following disciplines:” Hygiene”, Propedeutics of internal diseases”.

3. THE LIST OF EXPECTED LEARNING RESULTS ON THE SUBJECT (UNIT), MATCHED TO EXPECTED RESULTS OF MASTERING THE PROGRAM

The study of the discipline "Microbiology, Virology" is aimed at the formation of the following general professional competence (GPC) among students: GPC-7, according to the plan for the development of the educational program.

Competence content (or its main parts)	The proposed results of the course students are
<p>GPC-7 readiness to use basic physical and chemical, mathematical and other natural science concepts and methods for solving professional problems</p>	<p>To know: safety rules and work rules in the physical, chemical and biological laboratories, with reagents, instruments, animals; -dissemination of information in the medical and biological systems, the use of information and computer systems in medicine and health care; -classification, morphology and physiology of microorganisms and viruses, and its influence on the health of children and adolescents; -the spread of germs and its influence on human health. Ecology of microorganisms and its role in the cycle of matter. -Methods of microbiological diagnostics, -application of basic antibacterial, antiviral and drugs</p> <p>To be able to: hold the fence, marking and issue the direction of biological material from a patient and objects habitat for microbiological research; -interpret the results of the most common methods of laboratory and functional diagnostics; -explain a microbiological point the choice of material for the study during the diagnosis of infectious diseases; -use of physical, chemical and biological equipment; -Work with magnifying equipment (microscopes, optical and simple loops); -use educational, scientific, popular scientific literature, the Internet for professional activities.</p> <p>To be skilled in: basic technologies of transform information: text, table editors, search the Internet • skills of setting the preliminary diagnosis on the basis of the results of laboratory and instrumental examination of children and adolescents; • information on the principles of sterilization, disinfection and antiseptics of tools and equipment in order to avoid infection and the patient's physician; skill setting the preliminary diagnosis on the basis of the results of laboratory and instrumental examination..</p>

4. SUBJECT VOLUME

4.1. Subject volume in credits (total) 7

4.2. types of academic workload (in hours) 252

Type of academic workload	Number of hours (form of training -full-time)		
	Total in the plan	Throughout the semesters	
		semester №3	semester № 4
1	2	3	4
Student-Teacher activity	144	72	72


Classes:			
Lectures	36	18	18
Practical classes	108	54	54
Self-study work	72	54	18
Concurrent checking (number and type: a test, a colloquium, a report)	36	-	36
Term thesis			
Types of midterm assessment (an exam, a test)		offset	exam
Total number of hours on the subject	252	126	126

4.3. The content of a subject (unit.) Distribution of hours on themes and types of academic workload:

Form of training full-time

Name of sections and topics	Total	Types of classes					form of current knowledge control
		Classes		Interactive classes	Self-study work		
		lectures	practical classes and seminars				
1	2	3	4	5	6	7	
Section 1. General microbiology							
Subject and aims of medical microbiology. The morphology and taxonomy microorganisms. Microscopic research method. Sterilization and disinfection	14	2	6	1,5	6	Oral survey, test	
Physiology of microorganisms. Metabolism. Nutrition and respiration of bacteria. Culturing methods of aerobic and anaerobic bacteria	14	2	6	0,5	6	Oral survey, test	
Viruses. The discovery of viruses, its classification. Bacteriophages. The practical importance of phages in biology and medicine. The genetics of microorganisms. Biotechnology in microbiology. Molecular-biological methods of diagnosis	14	2	6	1	6	Oral survey, test	
Section 2. Infection. Doctrine about antibiotics.							

Infection: the role of microorganisms in infectious process. Biological diagnostic method. The role of host in the infectious process. Microbiological basics of antimicrobial therapy. Methods for determination sensitivity of bacteria to antibiotics	14	2	6	1	6	Oral survey, test
Section 3. Ecology of microorganisms						
Ecology of microorganisms. The human microflora and its function. Dysbiosis, methods of correction. Biofilms. Sanitary demonstration water microorganisms, soil, air, and methods of research	14	2	6		6	Oral survey, test
Section 4. Immunity						
Immunity. Serological methods – agglutination test, precipitation test, complement fixation test	14	2	6		6	Oral survey, test
Section 5. Special bacteriology and mycology						
Clinical Microbiology. Etiology and pathogenesis of nosocomial infections. The causative agents, properties and microbiological diagnostics of nosocomial infections. Pathogenic and opportunistic gram-positive and gram-negative cocci	14	2	6	1	6	Oral survey, test, solving of clinical cases
Pathogens of escherichiosis and dysentery. The causative agents of typhoid, salmonella poisoning and cholera	14	2	6	1	6	Oral survey, test, solving of clinical cases
Pathogens of diphtheria, whooping cough. Pathogens of legionellosis. Pathogenic mycobacteria.	14	2	6	1	6	Oral survey, test, solving of clinical cases

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

Pathogens of zoonotic infections: plague and anthrax. Yersiniosis. Pathogens of brucellosis, tularemia	10	2	6		2	Oral survey, test, solving of clinical cases
Pathogens of anaerobic infection: gas gangrene, tetanus, botulism	10	2	6		2	Oral survey, test, solving of clinical cases
Pathogens of spirochetosis and leptospirosis	10	2	6	1	2	Oral survey, test, solving of clinical cases
Rickettsia and Chlamydia	10	2	6	1	2	Oral survey, test, solving of clinical cases
Mycoplasma. Pathogenic and opportunistic fungi	10	2	6	1	2	Oral survey, test, solving of clinical cases
Section 6. Special virology						
Causative agents of viral respiratory diseases	10	2	6		2	Oral survey, test, solving of clinical cases
Causative agents of enteroviral infections and infections of the nervous system	10	2	6		2	Oral survey, test, solving of clinical cases
Herpesviruses. Viral agents of measles, rubella, mumps. Causative agents of slow viral infections. Prions.	10	2	6	1	2	Oral survey, test, solving of clinical cases
Hepatitis viral pathogens. Oncogenic viruses. Causative agents of AIDS	10	2	6	1	2	Oral survey, test, solving of clinical cases
Concurrent checking (Examination)	36					
Total	252	36	108		72	-

Interactive forms of classes

№	Name of the subject section	Interactive form of classes	Hours
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1	Section 1. General Microbiology. Subject and aims of medical microbiology. The morphology and taxonomy microorganisms. Microscopic research method. Sterilization and disinfection	Watching of the following films and their discussion: “History of Microbiology”, “Gram staining of bacteria”,	1,5
2	Physiology of microorganisms. Metabolism. Nutrition and respiration of bacteria. Culturing methods of aerobic and anaerobic bacteria	Watching of the film “Streak plate technique for isolation of pure culture of bacteria” and its discussion	0,5
3	Viruses. The discovery of viruses, its classification. Bacteriophages. The practical importance of phages in biology and medicine. The genetics of microorganisms. Biotechnology in microbiology. Molecular-biological methods of diagnosis	Watching of the following films and its discussion: “The 10 deadliest viruses in the history”, “Genetic recombinations in bacteria: transduction, conjugation, transformation”.	1
4	Section 2. Infection. Doctrine about antibiotics. Infection: the role of microorganisms in infectious process. Biological diagnostic method. The role of host in the infectious process. Microbiological basics of antimicrobial therapy. Methods for determination sensitivity of bacteria to antibiotics.	Watching of the film “Top-10 Epidemics in the History” and its discussion	1
5	Section 5. Special Bacteriology and Mycology. Clinical Microbiology. Etiology and pathogenesis of nosocomial infections. The causative agents, properties and microbiological diagnostics of nosocomial infections. Pathogenic and opportunistic gram-positive and gram-negative cocci	Solution and discussion of clinical cases	1
6	Pathogens of escherichiosis and dysentery. The causative agents of typhoid, salmonella poisoning and cholera	Solution and discussion of clinical cases	1
7	Pathogens of diphtheria, whooping cough. Pathogens of legionellosis. Pathogenic mycobacteria.	Solution and discussion of clinical cases	1
8	Pathogens of spirochetosis and leptospirosis	Solution and discussion of clinical cases	1
9	Rickettsia and Chlamydia	Solution and discussion of	1

		clinical cases	
10	Mycoplasma. Pathogenic and opportunistic fungi	Solution and discussion of clinical cases	1
11	Herpesviruses. Viral agents of measles, rubella, mumps. Causative agents of slow viral infections. Prions.	Solution and discussion of clinical cases	1
12	Hepatitis viral pathogens. Oncogenic viruses. Causative agents of AIDS	Solution and discussion of clinical cases	1
	Total		12

5. COURSE CONTENT

Section 1. General microbiology

Topic 1. Subject and aims of medical microbiology. The morphology and taxonomy microorganisms. Microscopic research method. Sterilization and disinfection.


Subject and objectives of microbiology. The classification and morphology of bacteria. Microscopic study method. The object and purpose of medical microbiology and its significance for the practical human health. A brief history of the microbiology, research methods. Systematics and nomenclature of microorganisms. Types of microbiology laboratories, rules of work in them. Technique of preparation of smears. Simple and complex staining techniques. Types of light microscopy. The shape and structure of the bacterial cell. The shell of bacteria: capsule, cell wall, its role and the methods of detection. Organelles and inclusions, its role, methods of detection. Flagella. Its structure and methods of detection. Spore, its role, methods of detection. Protoplasts and spheroplasts, L-form bacteria.

Topic 2. Physiology of microorganisms. Metabolism. Nutrition and respiration of bacteria. Culturing methods of aerobic and anaerobic bacteria.

The metabolism of microorganisms. Nutrition of microorganisms. Energy metabolism. Processes of anabolism and catabolism. Classification of bacteria energy sources, electron, essential elements. Mechanisms of transport of substances. Artificial growth media and requirements. Classification of culture media. Growth and reproduction of bacteria on artificial media. Energy metabolism. Respiration and its role. Aerobes and anaerobes. Identification of bacterial culture. Enzymes bacteria. Saccharolytic, proteolytic enzymes and peptolytic, methods of its determination. Aggression enzymes and its role. Principles for allocation of a pure culture of aerobic bacteria. Methods of cultivation of anaerobes.

Topic 3. Viruses. The discovery of viruses, its classification. Bacteriophages. The practical importance of phages in biology and medicine. The genetics of microorganisms. Biotechnology in microbiology. Molecular-biological methods of diagnosis.

Viruses. Bacteriophages. The discovery of viruses, classification. Structure virions. Chemi-

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

cal composition. Enzymes. Reproduction of viruses. Types of interaction of viruses with a cell. Cultivation of viruses. Bacteriophages, its morphology and reproduction. Virulent and temperate phages. Lysogenesis. Preparation of bacteriophage, its practical using. The genetics of microorganisms. Biotechnology in microbiology. Molecular-biological methods of diagnosis. Genome of bacteria and viruses. The implementation of hereditary information. Extrachromosomal heredity factors. variability of types of bacteria. Modifications. Mutations and its classification. Recombination variability: transformation, conjugation, transduction. Genetic engineering. Methods of work with DNA. Theoretical and practical significance of the study of microbial genetics.

Section 2. Infection. Doctrine about antibiotics

Topic 4. Infection: the role of microorganisms in infectious process. Biological diagnostic method. The role of host in the infectious process. Microbiological basics of antimicrobial therapy. Methods for determination sensitivity of bacteria to antibiotics.

The doctrine about infection and infectious disease. Exogenous and endogenous infections. The term "entrance gate" and the infectious dose. Transmission ways. Forms of infection. Periods of infectious disease. Pathogenicity and virulence, the units of the virulence. Virulence factors: adhesion, penetration, invasion, aggression. Toxicity. Exo- and endotoxins: effects on the body, the chemical nature. Classification of exotoxins on action mechanisms. The role of host in the infectious process. The concept of antibiotics. The story of its discovery. Classification of antibiotics. The mechanism of action on cells. The principles of determination antibiotics. Units of activity. Mechanisms of resistance of bacteria to antibiotics. Methods for determining the sensitivity of bacteria to antibiotics. Side effects of antibiotics.

Section 3. Ecology of microorganisms


Topic 5. Ecology of microorganisms. The human microflora and its function. Dysbiosis, methods of correction. Biofilms. Sanitary demonstration water microorganisms, soil, air, and methods of research.

Ecology of microorganisms. Forms of interspecies relationships. Sanitary microbiology. Microbiocenosis of water and soil. Evaluation of sanitary and microbiological status of the water and soil, sanitary indicative bacteria, bacterial number, coliform titer, coli-index, titer - perfringens. Air microflora. Methods of assessing the microbial air pollution. Sanitary-indicative bacteria. Evaluation of sanitary and microbiological status of foods and environmental objects. Normal microflora of the human body, its value. Gnotobiology. Factors that destroy the normal microflora. Dysbiosis. Correction of dysbiosis, drugs and products.

Section 4. Immunity.

Topic 6. Immunity. Serological methods – agglutination test, precipitation test, complement fixation test.

Immunity, its classification. The concept of the antigen. Antigens of bacteria, viruses, human. The concept of an antibody. Serological tests: concept and application. Agglutination test, precipitation test, complement fixation test.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

Section 5. Special bacteriology and mycology.

Topic 7. Clinical Microbiology. Etiology and pathogenesis of nosocomial infections. The causative agents, properties and microbiological diagnostics of nosocomial infections. Pathogenic and opportunistic gram-positive and gram-negative cocci.

Clinical microbiology, goals and objectives. Terms of occurrence of nosocomial infections. The term "nosocomial infections": causes and conditions of sources, propagation path. Characteristics of opportunistic pathogens. Laboratory diagnosis and prevention of nosocomial infections. Fam. Enterobacteriaceae. *Klebsiella* spp., *Proteus* spp., *Pseudomonas aeruginosa*. Its role in the occurrence of nosocomial infections. Their biological properties: morphology, tinctorial properties, culturing, antigens, toxins and virulence factors. *Helicobacter pylori*: biological properties, role in the occurrence of gastritis and gastric ulcer. Pyogenic cocci. Staphylococci. Streptococci. Meningococcus. Gonokokki. Classification. Characteristic. Role in the pathology. Immunity. Laboratory diagnosis. Treatment and prevention.

Topic 8. Pathogens of escherichiosis and dysentery. The causative agents of typhoid, salmonella poisoning and cholera.

The family Enterobacteriaceae. *Escherichia*. *Shigella*. *Salmonella*. The causative agents of cholera. Taxonomy and classification. Morphology and other biological properties. Pathogenesis and clinic induced diseases. Immunity. Prevention.

Topic 9. Pathogens of diphtheria, whooping cough. Pathogens of legionellosis. Pathogenic mycobacteria.

Diphtheria, whooping cough: biological properties. Pathogenesis and clinic induced diseases. Immunity. Specific prophylaxis. *Mycobacterium tuberculosis* and leprosy. Characteristic. Pathogenesis and clinical tuberculosis. Immunity. Specific prophylaxis.

Topic 10. Pathogens of zoonotic infections: plague and anthrax. Yersiniosis. Pathogens of brucellosis, tularemia.


The causative agents of zoonotic diseases: plague, tularemia, brucellosis, anthrax, yersiniosis. Biological properties. The pathogenesis, disease-causing form. Environmental pathogens. Specific prophylaxis.

Topic 11. Pathogens of anaerobic infection: gas gangrene, tetanus, botulism.

The causative agents of tetanus, gas gangrene, botulism. Environmental pathogens. The pathogenesis of diseases caused by pathogens. Specific therapy and prophylaxis of diseases.

Topic 12. Pathogens of spirochetosis and leptospirosis.

The causative agent of syphilis. Biological properties. Pathogenesis and forms of syphilis. Laboratory diagnosis. Immunity. Prevention. Pathogens borreliosis: biological properties, pathogenesis, laboratory diagnosis and prevention. Pathogen of system borreliosis (Lyme disease). Characteristic. Pathogenesis and clinical disease. Prevention. Leptospire: biological characteristics of

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

the pathogen, caused diseases, diagnosis, treatment and prevention.

Topic 13. Rickettsia and Chlamydia.

The morphology, physiology. The pathogenesis of diseases caused by pathogens. Laboratory diagnosis. Treatment and prevention.

Topic 14. Mycoplasma. Pathogenic and opportunistic fungi

The morphology, physiology of Mycoplasma. The pathogenesis of diseases caused by Mycoplasma. Laboratory diagnosis. Treatment and prevention. Classification of fungi. Morphology and cultivation. Diseases caused by pathogenic fungi, its classification. Opportunistic fungi, its role in human pathology.

Section 6. Special virology

Topic 15. Causative agents of viral respiratory diseases.

Orthomyxoviruses. The influenza virus. Structure and other biological properties. The pathogenesis of influenza. Immunity. Diagnostics. Specific prophylaxis. Adenoviruses: virion structure, disease. Laboratory diagnosis, treatment and prevention.

Topic 16. Causative agents of enteroviral infections and infections of the nervous system.

Polio virus. Pathogenesis and polio clinic. Specific prophylaxis. Rotavirus: virion structure, disease, laboratory diagnosis, treatment and prevention. Rabies virus. Biological properties and ecology. Role in human pathology. Flaviviruses, filoviruses: biological properties, disease. Laboratory diagnosis, treatment and prevention. Bunyaviridae: biological properties of viruses, epidemiology and pathogenesis of diseases caused by its. Viral agents of hemorrhagic fevers.

Topic 17. Herpesviruses. Viral agents of measles, rubella, mumps. Causative agents of slow viral infections. Prions.


Herpes simplex virus. The primary and recurrent herpes. Varicella zoster virus, herpes zoster. Cytomegalovirus. Pathogenesis and clinic induced diseases. Diagnostics. Prevention. Measles virus, mumps and rubella. Characteristic. The pathogenesis of diseases caused by its. Prevention. Slow infection. Pathogenesis and characteristics of slow infections. Prions are pathogens of slow infections.

Topic 18. Hepatitis viral pathogens. Oncogenic viruses. Causative agents of AIDS.

Pathogens of hepatitis. Features of viruses, pathogenesis of viral hepatitis. Immunity. Prevention. Fam. Retroviridae. Classification. Discovery of HIV. The structure and chemical composition of the virions. Antigens. Cultivation and reproduction. Epidemiology, pathogenesis of AIDS. The mechanism of destruction of immune system cells. Laboratory diagnosis, prevention and AIDS chemotherapy. Oncogenic RNA and DNA viruses. The morphology, classification, features of the interaction with the cell. The mechanism of tumorigenesis.

6. TOPICS OF PRACTICAL CLASSES

Section 1. General microbiology

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

Topic 1. Subject and aims of medical microbiology. The morphology and taxonomy microorganisms. Microscopic research method. Sterilization and disinfection.

Questions:


1. Subject of Medical Microbiology and its importance for practical health care. The history of microbiology.
2. The system and nomenclature of microorganisms.
3. Research microbiology methods.
4. Simple and complex staining techniques. The mechanism of staining smears. Tinctorial properties of microorganisms.
5. The light microscope, its main characteristics. Types of light microscopy (dark-field, phase - contrast, fluorescent). Immersion microscopy principles. Electron microscopy, atomic force microscopy.
6. The forms of the bacteria.
7. The structure of the bacterial cell: genome, cytoplasm, ribosome. Its structure, functions and methods of detection.
8. The shell of bacteria: cytoplasmic membrane, cell wall, capsule. The structure, functions and methods of detection.
9. Fimbria and pili. Its structure, functions and methods of detection.
10. Bacterial spores. Its role and structural features. Spore formation and methods of detection.

Topic 2. Physiology of microorganisms. Metabolism. Nutrition and respiration of bacteria. Culturing methods of aerobic and anaerobic bacteria.

Questions:

1. Anabolism and catabolism.
2. Mechanisms of nutrients transmission in the bacterial cell.
3. Autotrophs and heterotrophs, auxotrophs and prototrophs.
4. Classification of culture media.
5. Simple and complex nutrient medium.
6. Method for sowing nutritive medium.
7. Growth phases on medium.
8. Mechanism of bacterial respiration. Aerobes and anaerobes.
9. Methods of cultivation of anaerobic bacteria: culture media, equipment.
10. Isolation of pure culture of anaerobes.
11. Identification of the selected pure cultures of bacteria.
12. The main groups of bacteria enzymes.
13. Determination saccharolytic enzymes of bacteria.
14. Determination of proteolytic enzymes.
15. Determination peptolytic enzymes.
16. Aggression enzymes: coagulase, hyaluronidase, neuraminidase, DNA - ase, hemolysin.

Topic 3. Viruses. The discovery of viruses, its classification. Bacteriophages. The prac-

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

tical importance of phages in biology and medicine. The genetics of microorganisms. Biotechnology in microbiology. Molecular-biological methods of diagnosis.

Questions:


1. Classification of viruses. Virus and virion.
2. Morphology of viruses. The functions of RNA and DNA.
3. Chemical composition nukleoprotein. Enzymes.
4. Methods of viruses cultivation.
5. Interaction of viruses with cell virus. The mechanism of transcription and replication viral genome.
6. The mechanism of DNA and RNA viral integration into the cellular genome.
7. Ways transmission of viral infections.
8. The morphology of phages.
9. The mechanism of interaction between phages and the bacterial cell.
10. Virulent and temperate phages. Lysogenesis.
11. Titr phage. Methods for its determination.
12. Obtaining of phage culture. The using of phages in medicine.
13. Genotype and phenotype of bacteria.
14. Extrachromosomal factors in bacteria – plasmids, transposons, Is – sequence; its role.
15. Forms of variability in microorganisms.
16. Mutations, kinds of mutations in bacteria.
17. Genetic recombination in bacteria (transformation, transduction, conjugation).
18. The concept of the modifications.
19. The theoretical and practical importance of genetics: molecular-biological methods of diagnosis
The practical using of genetic engineering.

Section 2. Infection. Doctrine about antibiotics

Topic 4. Infection: the role of microorganisms in infectious process. Biological diagnostic method. The role of host in the infectious process. Microbiological basics of antimicrobial therapy. Methods for determination sensitivity of bacteria to antibiotics.

Questions:

1. The notion of infection and infectious disease. Forms of infection.
2. Exogenous and endogenous infections. The term "entrance gate and infective dose."
3. Sources, routs, and mechanisms of infections transmission.
4. The local and generalized infectious process. The spread ways of infections in the body. Notions: bacteremia, viremia, toksinemiya, sepsis, pyosepticemia.
5. Types of infection depending on the cause, pathogenesis, methods of infection, clinical manifestations.
6. Notions: monoinfection and mixed infection, primary and secondary infection, reinfection, superinfection, relapse.
7. Pathogenesis of infectious diseases. Periods of infection.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

8. The pathogenicity and virulence of microorganisms, measuring of virulence.
9. Virulence factors: adhesion, colonization, penetration, invasion.
10. Toxicity. Exotoxins. Classification of action mechanism.
11. Endotoxins. The chemical compound, action on the macroorganism.
12. Role microorganism in the occurrence of infection.
13. The notion of antibiotics, its discovery. Classification of antibiotics: on origin, method of preparation, action on a microorganism, antimicrobial spectrum.
14. The mechanism of action of antibiotics on microbial cells.
15. The principle of obtaining antibiotics. Activity of antibiotics.
16. The mechanism of bacterial resistance to antibiotics and how to deal with it.
17. Methods of determining the bacterial sensitivity to antibiotics.
18. Side effects of antibiotics.

Section 3. Ecology of microorganisms

Topic 5. Ecology of microorganisms. The human microflora and its function. Dysbiosis, methods of correction. Biofilms. Sanitary demonstration water microorganisms, soil, air, and methods of research.

Questions:


1. Ecology of microorganisms. Forms of interspecies relationships.
2. Role, value, and tasks of sanitary microbiology. Sanitary indicators of microorganisms.
3. Microflora of water and methods of its bacteriological examination (fermenting method, method of membrane filters). Sanitary indicators of water microorganisms.
4. Microflora of the soil and methods of bacteriological examination. Sanitary indicators of the soil microorganisms. Principles of the determination of microbial number, coli titre, perfringens titre and titre of soil termophylic bacteria.
5. Microflora of air and methods of bacteriological examination: sedimentation and aspiration methods. Sanitary indicators of air microorganisms.
6. General principles of sanitary and microbiological investigation of foodstuffs.
7. The normal microflora of the human body and its significance.
8. Factors that change the normal microflora of the organism. Dysbiosis, ways of its elimination.

Section 4. Immunity.

Topic 6. Immunity. Serological methods – agglutination test, precipitation test, complement fixation test.

Questions:

1. The notion of immunity. Classification of immunity.
2. The notion of an antigen, a chemical composition.
3. Bacterial antigens.
4. Antigens of viruses.
5. Notion of antibody, its structure and properties.
7. Serological tests – notion and its using in microbiological diagnostics.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		


8. Agglutination test - definition, components, using.
9. Precipitation test - definition, components, using.
10. Complement fixation test – components, phases of reaction and using.

Section 5. Special bacteriology and mycology.

Topic 7. Clinical Microbiology. Etiology and pathogenesis of nosocomial infections. The causative agents, properties and microbiological diagnostics of nosocomial infections. Pathogenic and opportunistic gram-positive and gram-negative cocci.

Questions:

1. Clinical microbiology, its tasks.
2. The causes of hospital infections.
3. Classification of nosocomial infections.
4. The main causative agents of nosocomial infections.
5. The sources and pathways of hospital infections.
6. Characteristics of opportunistic microorganisms that causes nosocomial infections.
7. The features of nosocomial infections.
8. Microbiological diagnostics and prevention of nosocomial infections.
9. Biological properties of bacteria *Klebsiella*: morphology, tinctorial properties, cultivation, biochemical properties, antigens, toxins, other pathogenicity factors.
10. Epidemiology and pathogenesis. Diseases.
11. Microbiological diagnostics, treatment and prevention of klebsiellosis.
12. Classification and biological properties of *Proteus*.
13. Diseases. Epidemiology and pathogenesis.
14. Microbiological diagnosis, treatment and prevention of *Proteus*-infections.
15. Biological properties of *Pseudomonas aeruginosa*.
16. Epidemiology and pathogenesis. Caused diseases.
17. Microbiological diagnostics, treatment and special prevention of *Pseudomonas* -infection.
18. The biological properties of *Helicobacter pylori*.
19. Epidemiology. Caused disease and pathogenesis.
20. Microbiological diagnostics, treatment, prevention of caused diseases.
21. General characteristics of pyogenic cocci group.
22. Taxonomy and biological properties of staphylococci.
23. Epidemiology and pathogenesis of diseases caused by staphylococci.
24. Microbiological diagnosis, treatment and specific prevention of staphylococcal infections.
25. Taxonomy and biological properties of the streptococci.
26. Epidemiology and pathogenesis of streptococcal infections.
27. Streptococci is causative agents of scarlatina and rheumatism.
28. The microbiological diagnosis, treatment and specific prevention of streptococcal infections.
29. Taxonomy and biological properties of meningococcus.
30. Epidemiology and pathogenesis of meningococcal infections.
31. Microbiological diagnosis, treatment and specific prevention of meningococcal infections.
32. Taxonomy and biological properties of gonococci.
33. Epidemiology and pathogenesis of gonococcal infections.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

34. Microbiological diagnosis, treatment and specific prevention of gonococcal infections.

Topic 8. Pathogens of escherichiosis and dysentery. The causative agents of typhoid, salmonella poisoning and cholera.


Questions:

1. The general characteristics of the family *Enterobacteriaceae*.
2. Opportunistic *Escherichia*: its role in the life of the human organism, caused diseases.
3. The biological properties of *Escherichia*.
4. Epidemiology and pathogenesis of diarrhoea-causing *E. coli*.
5. Microbiological diagnostics, treatment and prevention escherichiosis.
6. The taxonomy and biological properties of *Shigella*.
7. Epidemiology and pathogenesis of dysentery.
8. The microbiological diagnosis, treatment and specific prevention of dysentery.
9. Taxonomy and biological properties of pathogens *Salmonella*
10. Epidemiology and pathogenesis of typhoid - paratyphoid diseases, immunity.
11. Microbiological diagnosis of typhoid fever. Specific prevention and treatment of typhoid – paratyphoid diseases.
12. Epidemiology and pathogenesis of salmonellosis. Immunity.
13. Microbiological diagnosis, treatment and prevention of salmonellosis.
14. Classification of vibrio. The morphological, tinctorial, cultural property of agents cholera. Biochemical properties and antigens of *V. cholerae*.
15. Epidemiologiya and pathogenesis of cholera, immunity.
16. Bacteriological method of cholera diagnostic. Rapid methods and serological diagnostic of cholera. Prevention of cholera.

Topic 9. Pathogens of diphtheria, whooping cough. Pathogens of legionellosis. Pathogenic mycobacteria.

Questions:

1. The taxonomy and biological properties of the diphtheria bacteria.
2. Epidemiology and pathogenesis of diphtheria. The immunity.
3. Methods of laboratory diagnosis, treatment and specific prevention of diphtheria.
4. The taxonomy and biological properties of *Bordetella*.
5. Epidemiology and pathogenesis of whooping cough.
6. Laboratory diagnosis and specific prevention of pertussis.
7. The taxonomy and biological properties of *Legionella*.
8. Epidemiology of legionellosis.
9. Methods for the laboratory diagnosis of legionellosis.
10. Taxonomy and biological properties of the tuberculosis pathogen.
11. Epidemiology and pathogenesis of tuberculosis.
12. Methods of microbiological diagnostics and specific prevention of tuberculosis.
13. Biological features of leprosy pathogen, its methods of culturing.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

14. Epidemiology, pathogenesis and clinical forms of leprosy.
15. Microbiological diagnostics of leprosy. Treatment and prevention of leprosy.

Topic 10. Pathogens of zoonotic infections: plague and anthrax. Yersiniosis. Pathogens of brucellosis, tularemia.

Questions:

1. The taxonomy and biological properties of *Y. pestis*.
2. Epidemiology and pathogenesis of plague. The immunity.
3. Methods of laboratory diagnosis, treatment and specific prevention of plague.
4. The taxonomy and biological properties of *B. anthracis*.
5. Epidemiology and pathogenesis of anthrax.
6. Laboratory diagnosis and specific prevention of anthrax.
7. The taxonomy and biological properties of *Yersinia pseudotuberculosis* and *Y. enterocolitica*.
8. Epidemiology of yersiniosis.
9. Methods for the laboratory diagnosis of yersiniosis.
10. Taxonomy and biological properties of the brucellosis pathogen.
11. Epidemiology and pathogenesis of brucellosis.
12. Methods of microbiological diagnostics and specific prevention of brucellosis.
13. Biological features of tularemia pathogen, its methods of culturing.
14. Epidemiology, pathogenesis and clinical forms of tularemia.
15. Microbiological diagnostics of tularemia. Treatment and prevention of tularemia.

Topic 11. Pathogens of anaerobic infection: gas gangrene, tetanus, botulism.


Questions:

1. Biological properties of gas gangrene pathogen .
2. Epidemiology and pathogenesis of gas gangrene. The immunity.
3. Methods of laboratory diagnosis, treatment and specific prevention of gas gangrene.
4. The taxonomy and biological properties of tetanus pathogen.
5. Epidemiology and pathogenesis of tetanus.
6. Laboratory diagnosis and specific prevention of tetanus.
7. The taxonomy and biological properties of botulism pathogen .
8. Epidemiology of botulism.
9. Methods for the laboratory diagnosis and specific prevention of botulism.

Topic 12. Pathogens of spirochetosis and leptospirosis.

Questions:

1. Biological properties of *Treponema pallidum*.
2. Epidemiology and pathogenesis of syphilis. The immunity.
3. Methods of laboratory diagnosis, treatment and specific prevention of syphilis.
4. The taxonomy and biological properties of *Borrelia*.
5. Epidemiology and pathogenesis of borreliosis.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

6. Laboratory diagnosis and specific prevention of borreliosis.
7. The taxonomy and biological properties of *Leptospira* .
8. Epidemiology of leptospirosis.
9. Methods for the laboratory diagnosis and specific prevention of leptospirosis.

Topic 13. Rickettsia and Chlamydia.

Questions:

1. Biological properties of Rickettsia.
2. Epidemiology and pathogenesis of rickettsial diseases. The immunity.
3. Methods of laboratory diagnosis, treatment and specific prevention of rickettsial diseases.
4. The taxonomy and biological properties of Chlamydia.
5. Epidemiology and pathogenesis of Chlamydia diseases.
6. Laboratory diagnosis and specific prevention of Chlamydia diseases.

Topic 14. Mycoplasma. Pathogenic and opportunistic fungi

Questions:


1. The morphology, physiology of Mycoplasma.
2. The pathogenesis of diseases caused by Mycoplasma.
3. Laboratory diagnosis. Treatment and prevention of Mycoplasma diseases.
4. General characteristics of fungi (definition and taxonomy, morphology).
5. Primary mycoses (coccidioidomycosis, histoplasmosis, blastomycoses): characteristics of pathogen, pathogenesis, principle diagnosis, treatment and prophylaxis.
6. Opportunistic mycoses (surface and deep yeast mycoses, aspergillosis, mucormycoses, phaeohyphomycoses, hyalohyphomycoses, cryptococcoses; penicilliosis, pneumocystosis): characteristics of pathogen, pathogenesis, principle diagnosis, treatment and prophylaxis. Features of candidiasis diagnosis.
7. Subcutaneous mycoses (sporotrichosis, chromoblastomycosis, Madura foot (mycetoma): characteristics of pathogen, pathogenesis, principle diagnosis, treatment and prophylaxis.
8. Cutaneous mycoses (pityriasis versicolor, dermatomycoses): characteristics of pathogen, pathogenesis, principle diagnosis, treatment and prophylaxis.

Section 6. Special virology

Topic 15. Causative agents of viral respiratory diseases.

Questions:

1. Morphology and structure of orthomyxoviruses. Antigenic shift and drift.
2. Pathogenesis and diagnosis of influenza.
3. Prevention and therapy of influenza.
4. Morphology and structure of paramyxoviruses.
5. Pathogenesis and diagnosis of parainfluenza.
6. Prevention and therapy of parainfluenza.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

Topic 16. Causative agents of enteroviral infections and infections of the nervous system. Viral haemorrhagic fevers.


Questions:

1. General characteristics and classification of the family *Picornaviridae*.
2. Genus of enteroviruses. Classification: poliomyelitis, Coxsackie, ECHO. Characteristics of virions. Antigens. Cultivation. Pathogenicity for animals. Sensitivity to physical and chemical factors. Value of genetic heterogeneity of the populations of enteroviruses in the development of disease.
3. The role of enteroviruses in human pathology. Pathogenesis of poliomyelitis and other enteroviral infections. Immunity. Principles of specific prevention and therapy. The problem of poliomyelitis eradication in world.
4. Laboratory diagnosis of enteroviral infections.
5. Family *Reoviridae*, genus *Rotavirus*. General characteristics. Pathogenesis of rotavirus intestinal infection. Laboratory diagnosis and specific prevention and treatment of this disease.
6. Causative agent of rabies: peculiarities of the causative agent morphology, pathogenesis, laboratory diagnosis, prevention and treatment of the disease.
7. Causative agent of spring-summer encephalitis: peculiarities of the causative agent morphology, pathogenesis, laboratory diagnosis, prevention, and treatment of disease.
8. Causative agent of dengue fever: peculiarities of the causative agent morphology, pathogenesis, laboratory diagnosis, prevention, and treatment of disease.
9. Causative agent of Crimean-Congo haemorrhagic fever: peculiarities of the causative agent morphology, pathogenesis, laboratory diagnosis, prevention, and treatment.
10. Causative agent of haemorrhagic fever with renal syndrome: peculiarities of the causative agent morphology, pathogenesis, laboratory diagnosis, prevention, and treatment of disease.

Topic 17. Herpesviruses. Viral agents of measles, rubella, mumps. Causative agents of slow viral infections. Prions.

Questions:

1. General characteristics, classification and habitat of the herpesviruses.
2. Causative agent of alfa-, beta-, gamma-herpesviruses: peculiarities of the causative agent morphology.
3. Pathogenesis of herpesvirus disease, laboratory diagnosis, prevention, and treatment of the disease.
4. Morphology and structure of rubella viruses, mumps viruses and morbilli viruses.
5. Pathogenesis and diagnosis of rubella, mumps and morbilli infections.
6. Prevention and therapy of rubella, mumps and morbilli infections.
7. Characteristics of the causative agents of slow infections: measles, rabies, lentivirus infections, tick-borne encephalitis.
8. Features of prions as a source of disease. Prion diseases of animals (scrape, cow's spongiform encephalopathy) and humans (Kourou, Creutzfeldt-Jakob disease, Gerstmann-Straussler-Scheinker syndrome, familial fatal insomnia). Pathogenesis of prion diseases. Methods of postmorbidity and intravital diagnosis of diseases.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

Topic 18. Hepatitis viral pathogens. Oncogenic viruses. Causative agents of AIDS.

Questions:


1. Morphology and taxonomic position of hepatitis viruses.
2. Structure of hepatitis viruses: genome, capsid, envelope.
3. Replication HAV, HBV, HCV, HDV, and HEV: adsorption, penetration, proliferation, assembly.
4. Pathogenesis and diagnosis of hepatitis.
5. Laboratory diagnosis of hepatitis. Prevention and therapy of hepatitis.
6. Oncogenic viruses. Signs of cell transformation. Mechanism of the transforming action. Oncogenic DNA-containing and RNA-containing viruses. The role of viruses in carcinogenesis.
7. Morphology and taxonomic position of the HIV.
8. Structure of retroviruses: genome, capsid, envelope. Replication of retroviruses.
9. Pathogenesis and diagnosis of HIV infection, AIDS, opportunistic infections.
10. Laboratory diagnosis of HIV infection, AIDS, opportunistic infections. Prevention and therapy of retroviruses infections.

7. LABORATORY CLASSES: this type of work is not provided by the curriculum.

8. TOPICS OF COURSE, CONTROL WORKS, ABSTRACTS: this type of work is not provided by the curriculum.


9. LIST OF QUESTIONS FOR THE EXAM:

1. Subject of Medical Microbiology and its importance for practical health care. The history of microbiology.
2. Research microbiology methods.
3. Simple and complex staining techniques. The mechanism of staining smears. Tinctorial properties of microorganisms.
4. The light microscope, its main characteristics and composition. Types of light microscopy (dark-field, phase - contrast, fluorescent). Immersion microscopy principles. Electron microscopy, atomic force microscopy.
5. Morphology of bacteria (shapes). The system and nomenclature of microorganisms.
6. The structure of the bacterial cell: genome, cytoplasm, ribosome. Its structure, functions and methods of detection.
7. The shell of bacteria: cytoplasmic membrane, cell wall, capsule. The structure, functions and methods of detection.
8. Flagella and pili (fimbria). Its structure, functions and methods of detection.
9. Bacterial spores. Its role and structural features. Spore formation and methods of detection.
10. Microbial metabolism. Mechanisms of nutrients transmission in the bacterial cell. Auto-


RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

trophs and heterotrophs, auxotrophs and prototrophs.


11. The basic requirements of culture media. Classification of culture media. Simple and complex nutrient medium.
12. Method for sowing nutritive medium (Streak plate method).
13. Growth phases of bacteria on medium. Clon. Colony. Pure culture.
14. Mechanism of bacterial respiration. Aerobes and anaerobes.
15. Methods of cultivation of anaerobic bacteria: culture media, equipment.
16. Isolation of pure culture of aerobes.
17. Isolation of pure culture of anaerobes.
18. Classification of viruses. Virus and virion.
19. Morphology of viruses. Chemical composition nucleoprotein. Enzymes. The functions of RNA and DNA.
20. Methods of viral cultivation.
21. Interaction of viruses with cell virus (types of viral infection). The mechanism of transcription and replication viral genome.
22. Transmission ways of viral infections
23. The morphology of phages. The mechanism of interaction between phages and the bacterial cell. Virulent and temperate phages. Lysogenesis.
24. Bacterial genome. Extrachromosomal genetic factors in bacteria – plasmids, transposons, Is – sequence; its role.
25. Genetic recombination in bacteria: transformation (Frederick Griffith's experiment), transduction, conjugation).
26. The theoretical and practical importance of genetics: molecular-biological methods in diagnosis of infectious diseases (PCR, its use and mechanism). The practical using of genetic engineering.
27. The notion of infection and infectious disease. The clinical forms of infection. Periods of infection.
28. Exogenous and endogenous infections. The term "entrance gate" and "infective dose."
29. Sources, routs, and transmission of infections.
30. The local and generalized infectious process. Dissemination of microorganisms within the body. Bacteremia, viremia, toxemiya, sepsis, septicemia.
31. Classification of infections (monoinfection and mixed infection, primary and secondary infection, reinfection and superinfection). Pandemics, epidemics and endemics.
32. The pathogenicity and virulence of microorganisms, measuring of virulence. Virulence factors: adhesion, colonization, penetration, invasion.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		


33. Toxicity. Exotoxins and endotoxins
34. The notion of antibiotics, its discovery.
35. Classification of antibiotics: on origin, method of preparation, action, antimicrobial spectrum.
36. The mechanism of action of antibiotics on microbial cells. Activity of antibiotics.
37. Methods of determining the bacterial sensitivity to antibiotics.
38. Side effects of antibiotics. The mechanism of bacterial resistance to antibiotics and how to deal with it.
39. Ecology of microorganisms. Forms of interspecies relationships.
40. Microflora of water and methods of its bacteriological examination (fermenting method, method of membrane filters). Sanitary indicators of water microorganisms.
41. Microflora of the soil and methods of bacteriological examination. Sanitary indicators of the soil microorganisms.
42. Microflora of air and methods of bacteriological examination: sedimentation and aspiration methods. Sanitary indicators of air microorganisms.
43. The normal microflora of the human body and its significance. Factors that change the normal microflora of the organism. Dysbacteriosis, ways of its elimination.
44. The notion of immunity. Classification of immunity. Primary and secondary organs of immune system.
45. The notion of an antigen, a chemical composition. Bacterial antigens. Viral antigens. Antigens of human body.
46. Notion of antibody, its structure and properties. The main classes of immunoglobulins.
47. Mechanism of immune response (interaction of immune cells in human organism).
48. Clinical microbiology, its tasks. The causes of hospital (nosocomial) infections. Classification of hospital (nosocomial) infections.
49. The main causative agents of nosocomial infections. The sources and pathways of hospital infections. The features of nosocomial infections
50. *Klebsiella*: biological properties; epidemiology and pathogenesis of diseases that caused by *Klebsiella*; microbiological diagnostics, treatment and prevention of diseases.
51. *Proteus*: biological properties; epidemiology and pathogenesis of diseases that caused by *Proteus*; microbiological diagnostics, treatment and prevention of diseases.
52. *Pseudomonas aeruginosa*: biological properties; epidemiology and pathogenesis of diseases that caused by *P. aeruginosa*; microbiological diagnostics, treatment and prevention of diseases.
53. *Helicobacter pylori*: biological properties; epidemiology and pathogenesis of diseases that caused by *H. pylori*; microbiological diagnostics, treatment and prevention of diseases.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

54. *Staphylococcus*: biological properties; epidemiology and pathogenesis of diseases that caused by *Staphylococcus*; microbiological diagnostics, treatment and prevention of diseases.
55. *Streptococcus*: biological properties; epidemiology and pathogenesis of diseases that caused by *Streptococcus*; microbiological diagnostics, treatment and prevention of diseases.
56. The causative agent of meningitis: biological properties; epidemiology and pathogenesis of meningitis; microbiological diagnostics, treatment and prevention of meningitis.
57. The causative agent of gonorrhea: biological properties; epidemiology and pathogenesis of gonorrhea; microbiological diagnostics, treatment and prevention of gonorrhea.
58. *Escherichia coli*: biological properties; epidemiology and pathogenesis of diseases that caused *E. coli*; microbiological diagnostics, treatment and prevention of diseases. Classification of pathogenic *E. coli*: enterotoxigenic *E. coli* , enteropathogenic *E. coli*, enteroaggregative *E. coli*, enterohemorrhagic *E. coli*, enteroinvasive *E. coli*.
59. The causative agent of typhoid fever: biological properties; epidemiology and pathogenesis of typhoid fever; microbiological diagnostics, treatment and prevention of typhoid fever.
60. The causative agent of dysentery: species, biological properties; epidemiology and pathogenesis of dysentery; microbiological diagnostics, treatment and prevention of dysentery.
61. The causative agent of cholera: biological properties; epidemiology and pathogenesis of cholera; microbiological diagnostics, treatment and prevention of cholera.
62. The causative agent of diphtheria: biological properties; epidemiology and pathogenesis of diphtheria; microbiological diagnostics, treatment and prevention of diphtheria.
63. The causative agent of whooping cough: biological properties; epidemiology and pathogenesis of whooping cough; microbiological diagnostics, treatment and prevention of whooping cough.
64. The causative agent of tuberculosis: biological properties; epidemiology and pathogenesis of tuberculosis; microbiological diagnostics, treatment and prevention of tuberculosis.
65. The causative agent of leprosy: biological properties; epidemiology and pathogenesis of leprosy; microbiological diagnostics, treatment and prevention of leprosy.
66. The causative agent of plague: biological properties; epidemiology and pathogenesis of plague; microbiological diagnostics, treatment and prevention of plague.
67. The causative agent of anthrax: biological properties; epidemiology and pathogenesis of anthrax; microbiological diagnostics, treatment and prevention of anthrax.
68. The causative agent of brucellosis: biological properties; epidemiology and pathogenesis of brucellosis; microbiological diagnostics, treatment and prevention of brucellosis.
69. The causative agent of tularemia: biological properties; epidemiology and pathogenesis of tularemia; microbiological diagnostics, treatment and prevention of tularemia.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

70. The causative agent of gas gangrene: biological properties; epidemiology and pathogenesis of gas gangrene; microbiological diagnostics, treatment and prevention of gas gangrene.
71. The causative agent of tetanus: biological properties; epidemiology and pathogenesis of tetanus; microbiological diagnostics, treatment and prevention of tetanus.
72. The causative agent of botulism: biological properties; epidemiology and pathogenesis of botulism; microbiological diagnostics, treatment and prevention of botulism.
73. The causative agent of syphilis: biological properties; epidemiology and pathogenesis of syphilis; microbiological diagnostics, treatment and prevention of syphilis.
74. The causative agent of relapsing fever and Lyme's disease: biological properties; epidemiology and pathogenesis of relapsing fever and Lyme's disease; microbiological diagnostics, treatment and prevention of relapsing fever and Lyme's disease.
75. The causative agent of leptospirosis: biological properties; epidemiology and pathogenesis of leptospirosis; microbiological diagnostics, treatment and prevention of leptospirosis.
76. The causative agent of epidemic and endemic typhus: biological properties; epidemiology and pathogenesis of epidemic and endemic typhus; microbiological diagnostics, treatment and prevention of epidemic and endemic typhus.
77. *Chlamydia*: species, biological properties; epidemiology and pathogenesis of diseases that caused by *Chlamydia*; microbiological diagnostics, treatment and prevention of diseases.
78. *Mycoplasma*: species, biological properties; epidemiology and pathogenesis of diseases that caused by *Mycoplasma*; microbiological diagnostics, treatment and prevention of diseases.
79. Fungi: general characteristics (morphology, structure of cell, reproduction, cultivation, staining). Classification of pathogenic fungi.
80. Superficial mycoses (keratomycosis, dermatomycoses): pathogenesis, diseases, microbiological diagnosis, treatment and prophylaxis.
81. Subcutaneous mycoses: pathogenesis, diseases, microbiological diagnosis, treatment and prophylaxis.
82. Deep mycoses (systemic mycoses): pathogenesis, diseases, microbiological diagnosis, treatment and prophylaxis.
83. The causative agent of influenza: morphology and structure of virion, antigens, type of nucleic acid and cultivation of influenza virus. Antigenic shift and drift. Epidemiology and pathogenesis of influenza. Microbiological diagnosis, prophylaxis and treatment of influenza.
84. The causative agent of measles: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of measles. Microbiological diagnosis, prophylaxis and treatment of measles.
85. The causative agent of parainfluenza: morphology and structure of virion, antigens, type of

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

nucleic acid and cultivation of virus. Epidemiology and pathogenesis of parainfluenza. Microbiological diagnosis, prophylaxis and treatment of parainfluenza.

86. The causative agent of mumps: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of mumps. Microbiological diagnosis, prophylaxis and treatment of mumps.

87. The causative agent of rubella: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of rubella. Microbiological diagnosis, prophylaxis and treatment of rubella.

88. The causative agent of adenoviral infections: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of adenoviral infections. Microbiological diagnosis, prophylaxis and treatment of adenoviral infections.

89. The causative agent of poliomyelitis: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of poliomyelitis. Microbiological diagnosis, prophylaxis and treatment of poliomyelitis.

90. The causative agent of rabies: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of rabies. Microbiological diagnosis, prophylaxis and treatment of rabies.

91. *Flaviviridae*: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of diseases that caused by viruses. Microbiological diagnosis, prophylaxis and treatment of diseases.

92. *Bunyaviridae*: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of diseases that caused by viruses. Microbiological diagnosis, prophylaxis and treatment of diseases.

93. *Filoviridae*: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of diseases that caused by viruses. Microbiological diagnosis, prophylaxis and treatment of diseases.

94. *Herpesviridae*: subfamilies, genera. Morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of diseases that caused by viruses. Microbiological diagnosis, prophylaxis and treatment of diseases.

95. The causative agent of hepatitis A: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of hepatitis A. Microbiological diagnosis, prophylaxis and treatment of hepatitis A.

96. The causative agent of hepatitis B: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of hepatitis B. Microbiological diagnosis, prophylaxis and treatment of hepatitis B. Hepatitis D (delta virus).

97. The causative agent of hepatitis C: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of hepatitis C. Microbiological diagnosis, prophylaxis and treatment of hepatitis C.

98. The causative agent of hepatitis E: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of hepatitis E. Microbiological diagnosis, prophylaxis and treatment of hepatitis E.

99. The causative agent of HIV: morphology and structure of virion, antigens, type of nucleic acid and cultivation of virus. Epidemiology and pathogenesis of HIV. Microbiological diagnosis, prophylaxis and treatment of HIV.

10. SELF-STUDY WORK OF STUDENTS

Form of training full-time

№	The unit title	Type of self-study work	Amount of hours	Type of control
1	Section 1. General microbiology. Subject and aims of medical microbiology. The morphology and taxonomy microorganisms. Microscopic research method. Sterilization and disinfection.	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	6	Oral survey, checkup of tasks in copybook
2	Physiology of microorganisms. Metabolism. Nutrition and respiration of bacteria. Culturing methods of aerobic and anaerobic bacteria	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	6	Oral survey, checkup of tasks in copybook
3	Viruses. The discovery of viruses, its classification. Bacteriophages. The practical importance of phages in biology and medicine. The genetics of microorganisms. Biotechnology in microbiology. Molecular-biological methods of diagnosis	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks, preparation of multimedia presentations	6	Oral survey, checkup of tasks in copybook, checkup of presentation

4	<p>Section 2. Infection. Doctrine about antibiotics.</p> <p>Infection: the role of microorganisms in infectious process. Biological diagnostic method. The role of host in the infectious process. Microbiological basics of antimicrobial therapy. Methods for determination sensitivity of bacteria to antibiotics</p>	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	6	Oral survey, checkup of tasks in copybook
5	<p>Section 3. Ecology of microorganisms.</p> <p>Ecology of microorganisms. The human microflora and its function. Dysbiosis, methods of correction. Biofilms. Sanitary demonstration water microorganisms, soil, air, and methods of research.</p>	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks, preparation of multimedia presentations	6	Oral survey, checkup of tasks in copybook, checkup of presentation
6	<p>Section 4. Immunity.</p> <p>Immunity. Serological methods – agglutination test, precipitation test, complement fixation test</p>	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	6	Oral survey, checkup of tasks in copybook
7	<p>Section 5. Special bacteriology and mycology .</p> <p>Clinical Microbiology. Etiology and pathogenesis of nosocomial infections. The causative agents, properties and microbiological diagnostics of nosocomial infections. Pathogenic and opportunistic gram- positive and gram-negative cocci</p>	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	6	Oral survey, checkup of tasks in copybook
8	Pathogens of escherichiosis and dysentery. The causative agents of typhoid, salmonella poisoning and cholera	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	6	Oral survey, checkup of tasks in copybook

9	Pathogens of diphtheria, whooping cough. Pathogens of legionellosis. Pathogenic mycobacteria	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	6	Oral survey, checkup of tasks in copybook
10	Pathogens of zoonotic infections: plague and anthrax. Yersiniosis. Pathogens of brucellosis, tularemia	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	2	Oral survey, checkup of tasks in copybook
11	Pathogens of anaerobic infection: gas gangrene, tetanus, botulism	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	2	Oral survey, checkup of tasks in copybook
12	Pathogens of spirochetosis and leptospirosis	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	2	Oral survey, checkup of tasks in copybook
13	Rickettsia and Chlamydia	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	2	Oral survey, checkup of tasks in copybook
14	Mycoplasma. Pathogenic and opportunistic fungi	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	2	Oral survey, checkup of tasks in copybook
15	Section 6. Special virology. Causative agents of viral respiratory diseases	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	2	Oral survey, checkup of tasks in copybook
16	Causative agents of enteroviral infections and infections of the nervous system. Viral haemorrhagic fevers	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	2	Oral survey, checkup of tasks in copybook
17	Herpesviruses. Viral agents of measles, rubella, mumps. Causative agents of slow viral infections. Pri-	Preparation for classes, work with literature sources, performing of tasks for self-guided	2	Oral survey, checkup of tasks in copybook

	ons.	work in the copybooks		
18	Hepatitis viral pathogens. Oncogenic viruses. Causative agents of AIDS	Preparation for classes, work with literature sources, performing of tasks for self-guided work in the copybooks	2	Oral survey, checkup of tasks in copybook

11. УЧЕБНО-МЕТОДИЧЕСКОЕ И ИНФОРМАЦИОННОЕ ОБЕСПЕЧЕНИЕ ДИСЦИПЛИНЫ

а) Список рекомендуемой литературы

основная

1) Medical microbiology : a guide to microbial infections: pathogenesis, immunity, laboratory investigation and control / ed. by M. R. Barer, W. Irving, A. Swann, N. Perera. - 19th ed. - London : Elsevier, 2018. - 743 p.

2) Medical microbiology, virology and immunology. Lecture notes = Медицинская микробиология, вирусология и иммунология : textbook : учебное пособие для вузов уровня специалитета по направлению подготовки 31.05.01 "Лечебное дело" / М. N. Artamonova [и др.]. - Moscow : GEOTAR-Media, 2020. - 352 p.

дополнительная


1) Microbiology, virology: clinical application cases. General microbiology. Part 1 / М. N. Artamonova, N. I. Potaturkina-Nesterova, I. S. Nemova, A. S. Khitrova; Ulyanovsk State University, Institute of Medicine, Ecology and Physical culture. - Ulyanovsk : ULSU, 2018. - Текст на англ. яз.

<http://lib.ulsu.ru/MegaPro/Download/MObject/1372>

учебно-методическая

1) General microbiology : classification, morphology and ultrastructure of microorganisms : manual for foreign students of medical faculty / М. N. Artamonova, N. I. Potaturkina-Nesterova, I. S. Nemova, A. S. Alekseeva; Ulyanovsk State University. - Ulyanovsk : ULSU, 2016. - На англ. яз.; <http://lib.ulsu.ru/MegaPro/Download/MObject/6>

2) Artamonova M. N. Microbiology, virology : guidelines for practical classes for foreign students. Part 1 / М. N. Artamonova, N. I. Potaturkina-Nesterova, I. S. Nemova; Ulyanovsk State University, The Institute of Medicine, Ecology and Physical Culture. - Ulyanovsk : ULSU, 2016. - На англ. яз.

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

<http://lib.ulsu.ru/MegaPro/Download/MObject/5>

3) Artamonova M. N. Microbiology, virology : guidelines for practical classes for foreign students. Part 2 / M. N. Artamonova, N. I. Potaturkina-Nesterova, I. S. Nemova; Ulyanovsk State University, The Institute of Medicine, Ecology and Physical Culture. - Ulyanovsk : ULSU, 2017.

<http://lib.ulsu.ru/MegaPro/Download/MObject/913>

Agreed:

Гл. библиотекарь ООП НБ УЛГУ / Стадольникова Д. Р. / Смаг / _____
 Должность сотрудника научной библиотеки ФИО подпись

b) Professional databases, information and reference systems

1. Электронно-библиотечные системы:

1.1. IPRbooks : электронно-библиотечная система : сайт / группа компаний Ай Пи Ар Медиа. - Саратов, [2020]. – URL: <http://www.iprbookshop.ru>. – Режим доступа: для зарегистрир. пользователей. - Текст : электронный.

1.2. ЮРАЙТ : электронно-библиотечная система : сайт / ООО Электронное издательство ЮРАЙТ. – Москва, [2020]. - URL: <https://www.biblio-online.ru>. – Режим доступа: для зарегистрир. пользователей. - Текст : электронный.

1.3. Консультант студента : электронно-библиотечная система : сайт / ООО Политехресурс. – Москва, [2020]. – URL: http://www.studentlibrary.ru/catalogue/switch_kit/x2019-128.html. – Режим доступа: для зарегистрир. пользователей. – Текст : электронный.


1.4. Лань : электронно-библиотечная система : сайт / ООО ЭБС Лань. – Санкт-Петербург, [2020]. – URL: <https://e.lanbook.com>. – Режим доступа: для зарегистрир. пользователей. – Текст : электронный.

1.5. **Znanium.com** : электронно-библиотечная система : сайт / ООО Знаниум. - Москва, [2020]. - URL: <http://znanium.com>. – Режим доступа : для зарегистрир. пользователей. - Текст : электронный.

1.6. Clinical Collection : коллекция для медицинских университетов, клиник, медицинских библиотек // EBSCOhost : [портал]. – URL: <http://web.a.ebscohost.com/ehost/search/advanced?vid=1&sid=e3ddf99-a1a7-46dd-a6eb-2185f3e0876a%40sessionmgr4008>. – Режим доступа : для авториз. пользователей. – Текст : электронный.

2. КонсультантПлюс [Электронный ресурс]: справочная правовая система. /ООО «Консультант Плюс» - Электрон. дан. - Москва : КонсультантПлюс, [2020].

3. Базы данных периодических изданий:

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

3.1. База данных периодических изданий : электронные журналы / ООО ИВИС. - Москва, [2020]. – URL: <https://dlib.eastview.com/browse/udb/12>. – Режим доступа : для авториз. пользователей. – Текст : электронный.

3.2. eLIBRARY.RU: научная электронная библиотека : сайт / ООО Научная Электронная Библиотека. – Москва, [2020]. – URL: <http://elibrary.ru>. – Режим доступа : для авториз. пользователей. – Текст : электронный

3.3. «Grebennikon» : электронная библиотека / ИД Гребенников. – Москва, [2020]. – URL: <https://id2.action-media.ru/Personal/Products>. – Режим доступа : для авториз. пользователей. – Текст : электронный.

4. Национальная электронная библиотека : электронная библиотека : федеральная государственная информационная система : сайт / Министерство культуры РФ ; РГБ. – Москва, [2020]. – URL: <https://нэб.рф>. – Режим доступа : для пользователей научной библиотеки. – Текст : электронный.

5. SMART Imagebase // EBSCOhost : [портал]. – URL: <https://ebco.smartimagebase.com/?TOKEN=EBSCO-1a2ff8c55aa76d8229047223a7d6dc9c&custid=s6895741>. – Режим доступа : для авториз. пользователей. – Изображение : электронные.

6. Федеральные информационно-образовательные порталы:

6.1. [Единое окно доступа к образовательным ресурсам](http://window.edu.ru/) : федеральный портал / учредитель ФГАОУ ДПО ЦРГОП и ИТ. – URL: <http://window.edu.ru/>. – Текст : электронный.

6.2. [Российское образование](http://www.edu.ru) : федеральный портал / учредитель ФГАОУ ДПО ЦРГОП и ИТ. – URL: <http://www.edu.ru>. – Текст : электронный.

7. Образовательные ресурсы УлГУ:


7.1. Электронная библиотека УлГУ : модуль АБИС Мега-ПРО / ООО «Дата Экспресс». – URL: <http://lib.ulsu.ru/MegaPro/Web>. – Режим доступа : для пользователей научной библиотеки. – Текст : электронный.

7.2. Образовательный портал УлГУ. – URL: <http://edu.ulsu.ru>. – Режим доступа : для зарегистр. пользователей. – Текст : электронный.

Agreed:

Зам. начальника УИТТ / Ключкова А. В. / 
position *name*

12. MATERIAL AND TECHNICAL SUPPORT OF THE SUBJECT

RF Ministry of Education and Science Ulyanovsk State University	Форма	
F – Educational plan in “Microbiology, virology”		

Specialized training laboratory microbiology must have individual jobs for students, equipped with microscopes, and facilities for making micropreparations, bacteriological research and productions of immunological reactions (dyes, alcohol lamp, racks, trays, bacterial loop, tubes, automatic dispensers, pipettes, sets disks with antibiotics thermostat, vaccines, sera, diagnostic preparations). It also requires basic equipment for the preparation and storage of culture media and disinfection / sterilization: autoclave ("clean" and "dirty"), dry-heat sterilizer, distiller, fridge. Visual aids (tables, posters and are fixed preparations of bacteria) in the diagnosis of major infectious diseases, and others.

Creators



signature

associate professor

position

Artamonova M. N.

full name



signature

professor

position

Potaturkina-Nesterova N. I.

full name