**APPROVED**
*by*
the Academic Board of the Institute
for Medicine, Ecology and Physical Education at
Ulyanovsk State University
May 16th, 2024, Record № 9/260
*date*
Chairperson _____ V. V. Mashin
*signature* *surname, initials*

# COURSE SYLLABUS

| | |
|---|---|
| Course Title | Microbiology, virology |
| Faculty | Faculty of Medicine named after T.Z. Biktimirov |
| Department | Department of General and Clinical Pharmacology with Microbiology course |
| Year of study | 2 |

Field of study General Medicine 31.05.01
*Name* *code*
Speciality/ profile not provided
Mode of study full-time
*full-time, part-time (specify those implemented)*
First introduced in the educational process at Ulyanovsk State University September 1st, 2024

Updated at the department session: record №_____ of _____ .

Course designer

| Full name | Department | Job title, Academic Qualification (Degree) |
|---|---|---|
| Artamonova Marina Nikolayevna | Department of General and Clinical Pharmacology with Microbiology course | PhD in Biological Science Associate Professor |
| Potaturkina-Nesterova Natalia Iosifovna | Department of General and Clinical Pharmacology with Microbiology course | PhD in Medical Science Professor |

| AGREED by | AGREED by |
|---|---|
| Head of the department of General and Clinical Pharmacology with Microbiology course implementing the discipline | Head of the Graduating Department of Hospital Therapy |
| _____ Markevich M. P.<br>*Signature* *Surname, initials* | _____ Vise-Khripunova M.A.<br>*Signature* *Surname, initials* |
| «April 24th» 2024 | «April 24th» 2024 |

## 1. COURSE AIMS AND OBJECTIVES:

**Course aims:**

The course of Microbiology, virology contributes to a better understanding of role of microorganisms in occurrence of contagious diseases with respect to general characters of causative agents, methods of diagnosis and prophylaxis of contagious diseases.

**Course objectives***:*

- to introduce students to the foundations of Microbiology - the concepts of classification, morphology, growth and ecology of microorganisms that cause contagious diseases in human
- to develop a basic understanding about infections, their classification and to gain knowledge on various diseases generated during the pathogenic role of those organisms
- to establish understanding of methods of laboratory diagnosis of contagious diseases and explore how to choose appropriate methods for diagnosis of bacterial, viral and fungal diseases
- to focus on comprehension of the mechanisms of action of antimicrobial agents at various microorganisms and contribute that knowledge in the treatment, prevention, and control of contagious diseases caused by microorganisms

## 2. THE COURSE POSITION WITHIN THE FRAMEWOK OF THE NATIONAL CURRICULUM FOR HIGHER PROFESSIONAL EDUCATION:

The course of Microbiology, virology refers to Core Module of the National Curriculum of Higher Professional Education implemented by the higher educational institution.

The course is based on the previous study of such disciplines as Anatomy, Biology, Chemistry, Biochemistry, Histology, Embryonic development of body tissues.

The skills acquired are essential for the further of Normal physiology, Pathological anatomy, Pathophysiology, Clinical pathophysiology, Obstetrics and gynecology, Forensic Medicine, Physiology of the visceral systems.

## 3. EXPECTED LEARNING OUTCOMES

| **Code and name of the competence to be developed** | **Description of expected learning outcomes and competence indicator** |
|---|---|
| **ОПК-5**<br>*Capacity to assess morphofunctional, physiological conditions and pathological processes in the human body to solve professional problems* | ИДК. ОПК-5<br>On completing the course, a student is expected<br>– to construct knowledge of evaluation in morphofunctional state based on acquired knowledge |

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|---|---|
| | -to able to distinguish pathological and physiological processes and determine the etiology of changes<br>-to master to give diagnostic assessment of identified changes |

## 4.COURSE ESTIMATED WORKLOAD

### 4.1. Estimated workload in credits - 7

### 4.2. Estimated workload in academic hours - 252

| **Educational activities** | **Academic hours (mode of study: full-time)** | | |
|---|---|---|---|
| | **Total academic hours** | **Term** | |
| | | **Term 3** | **Term 4** |
| 1 | 2 | 3 | 4 |
| Classroom activities | 144 | 72 | 72 |
| Classes: | | | |
| lectures | 36 | 18 | 18 |
| practical classes | 108 | 54 | 54 |
| Independent study | 72 | 54 | 18 |
| Formative assessment (tests, quizzes, essays etc) | 36 | - | 36 |
| Interim Assessment/ Summative Assessment (exams, tests/credit | | credit | exam |
| Total academic hours | 252 | 126 | 126 |

**4.3. Course structure diagram. Allocation of academic hours to types of educational activities**
**Mode of study: full-time**

| Sections and topics | Total | Session types | | | | |
|---|---|---|---|---|---|---|
| | | Classroom sessions | | Interactive sessions | Independent study | Formative assessment |
| | | lectures | practical classes | | | |
| 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. Cultivation 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 | 14 | 2 | 6 | 1 | 6 | Oral survey, test |

| | | | | | | |
|---|---|---|---|---|---|---|
| basics of antimicrobial therapy. Methods for determination sensitivity of bacteria to antibiotics | | | | | | |
| **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. | 14 | 2 | 6 | 1 | 6 | Oral survey, test, solving clinical cases |
| Pathogenic and opportunistic gram-positive and gram-negative cocci | 14 | 2 | 6 | | 6 | Oral survey, test, solving 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 clinical cases |

| | | | | | | |
|---|---|---|---|---|---|---|
| Pathogens of diphtheria, whooping cough. Pathogens of legionellosis. Pathogenic mycobacteria. | 14 | 2 | 6 | 1 | 2 | Oral survey, test, solving clinical cases |
| Pathogens of zoonotic infections: plague and anthrax. Yersiniosis. Pathogens of brucellosis, tularemia | 14 | 2 | 6 | | 2 | Oral survey, test, solving clinical cases |
| Pathogens of anaerobic infection: gas gangrene, tetanus, botulism | 14 | 2 | 6 | | 2 | Oral survey, test, solving clinical cases |
| Pathogens of spirochetosis and leptospirosis | 14 | 2 | 6 | 1 | 2 | Oral survey, test, solving clinical cases |
| Rickettsia and Chlamydia. Mycoplasma. Pathogenic and opportunistic fungi | 14 | 2 | 6 | 2 | 2 | Oral survey, test, solving clinical cases |
| **Section 6. Special virology** | | | | | | |
| Causative agents of viral respiratory diseases | 14 | 2 | 6 | | 2 | Oral survey, test, solving clinical cases |
| Causative agents of enteroviral infections and infections of the nervous system | 14 | 2 | 6 | | 2 | Oral survey, test, solving clinical cases |
| Herpesviruses. Viral agents of measles, rubella, mumps. Causative agents of slow viral infections. Prions. | 14 | 2 | 6 | 1 | 2 | Oral survey, test, solving clinical cases |
| Hepatitis viral pathogens. Oncogenic viruses. Causative agents of AIDS | 14 | 2 | 6 | 1 | 2 | Oral survey, test, solving clinical cases |
| Concurrent checking (Examination ) | 36 | | | | | |
| **Total** | **252** | **36** | **108** | 12 | **72** | - |

If it is necessary to use partially or exclusively distance learning technologies in the educational process, it should be noted that the total number of hours (c.u.) set by the Department of discipline/specialty for each discipline/practice remains unchanged and is implemented in full. In this case, in the corresponding section of the educational program the total number of hours of work with students in accordance with the educational plan is allocated and the number of hours for conducting classes in a remote format using e-learning (online courses, lectures and seminars in videoconference mode, virtual practical classes, laboratory work in the form of virtual analogues, calculation and graphic works, individual tasks in the electronic information and educational environment, etc.) Training and industrial practice for all areas of discipline/specialties of all forms of training can be partially or fully implemented in a remote format.

Interactive forms of classes

| № | Name of the subject section | Interactive form of classes | Hours |
|---|---|---|---|
| 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. Cultivation 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”,<br>“Genetic recombinations in bacteria: transduction, conjugation, transformation”. | 1 |
| 4 | **Section 2. Infection. Doctrine about antibiotics.**<br>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.**<br>Clinical Microbiology. Etiology and pathogenesis of<br>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 clinical cases | 1 |
| 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. Cultivation 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. Carbohydraye-splitting, proteolytic and peptolitic enzymes, methods of their 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. Chemical 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.

**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.

**Topic 8. Pathogenic and opportunistic gram-positive and gram-negative cocci.**

Pyogenic cocci. Staphylococci. Streptococci. Meningococcus. Gonococci. Classification. Characteristic. Role in the pathology. Immunity. Laboratory diagnosis. Treatment and prevention.

**Topic 9. 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 10. 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 11. 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 12. 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 13. 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. Leptospires: biological characteristics of the pathogen, caused diseases, diagnosis, treatment and prevention.

**Topic 14. Rickettsia and Chlamydia. Mycoplasma. Pathogenic and opportunistic fungi**

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

**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.
11. Sterilization. Methods of sterilization.
12. Disinfection: definition, methods.

**Topic 2. Physiology of microorganisms. Metabolism. Nutrition and respiration of bacteria. Cultivation 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 selectioned pure cultures of bacteria.
12. The main groups of bacteria enzymes.
13. Determination of carbohydrate-splitting enzymes of bacteria.
14. Determination of proteolytic enzymes.
15. Determination peptolytic enzymes.
16. Aggressive enzymes: coagulase, hyaluronidase, neuraminidase, DNA - ase, hemolysin.

**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.**

**Questions**:

1. Classification of viruses. Virus and virion.
2. Morphology of viruses. The functions of RNA and DNA.
3. Chemical composition nucleoprotein. Enzymes.
4. Methods of viruses cultivation.
5. Interaction of viruses with cell virus. The mechanism of transcription and replication of viral genome.

6. The mechanism of DNA and RNA viral integration into the cellular genome.
7. Transmission ways 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. Titre of 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.
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.
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.**

**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.

**Topic 8. Pathogenic and opportunistic gram-positive and gram-negative cocci.**

**Questions:**

1. Taxonomy and biological properties of staphylococci.
2. Epidemiology and pathogenesis of diseases caused by staphylococci.
3. Microbiological diagnosis, treatment and specific prevention of staphylococcal infections.
4. Taxonomy and biological properties of the streptococci.
5. Epidemiology and pathogenesis of streptococcal infections.
6. Streptococci is causative agents of scarlatina and rheumatism.
7. The microbiological diagnosis, treatment and specific prevention of streptococcal infections.
8. Taxonomy and biological properties of meningococcus.

9. Epidemiology and pathogenesis of meningococcal infections.
10. Microbiological diagnosis, treatment and specific prevention of meningococcal infections.
11. Taxonomy and biological properties of gonococci.
12. Epidemiology and pathogenesis of gonococcal infections.
13. Microbiological diagnosis, treatment and specific prevention of gonococcal infections.

**Topic 9. 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 10. 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.
14. Epidemiology, pathogenesis and clinical forms of leprosy.
15. Microbiological diagnostics of leprosy. Treatment and prevention of leprosy.

**Topic 11. 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 12. 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 13. 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.
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 14. Rickettsia and Chlamydia. Mycoplasma. Pathogenic and opportunistic fungi.**

**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.
7. The morphology, physiology of Mycoplasma.
8. The pathogenesis of diseases caused by Mycoplasma.
9. Laboratory diagnosis. Treatment and prevention of Mycoplasma diseases.
10. General characteristics of fungi (definition and taxonomy, morphology).
11. Primary mycoses (coccidioidomycosis, histoplasmosis, blastomycoses): characteristics of pathogen, pathogenesis, principle diagnosis, treatment and prophylaxis.
12. 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.
13. Subcutaneous mycoses (sporotrichosis, chromoblastomycosis, Madura foot (mycetoma): characteristics of pathogen, pathogenesis, principle diagnosis, treatment and prophylaxis.
14. 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.

**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, Creuzfeldt-Jakob disease, Gerstmann-Straussler-Scheinker syndrome, familial fatal insomnia). Pathogenesis of prion diseases. Methods of postmorbidity and intravital diagnosis of diseases.

**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 SESSIONS

*This type of sessions is not provided by the Curriculum*

## 8.TOPICS OF COURSE ASSIGNMENTS, TESTS AND ESSAYS

*These types of educational activities are not provided by the curriculum*

## 9. QUESTIONS FOR EXAM ON DISCIPLINE "MICROBIOLOGY, VIROLOGY"

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. Autotrophs 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.

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.

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 whopping cough: biological properties; epidemiology and pathogenesis of whopping cough*;* microbiological diagnostics, treatment and prevention of whopping 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.

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 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. INDEPENDENT STUDY

**Mode of study: full-time.**

| № | Name of the section / subject | Types of SSW | Total number of hours | Current control |
|---|---|---|---|---|
| 1 | **Section 1. General microbiology**.<br>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. Cultivation 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 |

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|---|---|---|---|---|
| 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 |
| | **Section 2. Infection. Doctrine about antibiotics.** | | | |
| 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 | Preparation for classes, work with literature sources, performing of tasks for self-guided workin the copybooks | 6 | Oral survey, checkup of tasks in copybook |
| 5 | **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. | 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 oftasks in copybook, checkup of presentation |
| 6 | **Section 4. Immunity**. Immunity. Serological methods –agglutination test, precipitation test, complement fixation test | 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 | **Section 5. Special bacteriology and mycology**. Clinical Microbiology. Etiology and pathogenesis of nosocomial infections. The causative agents, properties and microbiological diagnostics of nosocomial infections. | Preparation for classes, work with literature sources, performing of tasks for self-guided workin the copybooks | 6 | Oral survey, checkup of tasks in copybook |
| 8 | Pathogenic and opportunistic gram- positive and gram-negative cocci | 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 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 | 6 | Oral survey, checkup of tasks in copybook |

| | | | | |
|---|---|---|---|---|
| | | in the copybooks | | |
| 10 | Pathogens of diphtheria, whooping cough. Pathogens of legionellosis. Pathogenic mycobacteria | Preparation for classes, work with literature sources, performing of tasks for self-guided work | 2 | Oral survey, checkup of tasks in copybook |
| 11 | Pathogens of zoonotic infections: plague and anthrax. Yersiniosis. Pathogens of brucellosis, tularemia. | Preparation for classes, work with literature | 2 | Oral survey, checkup of |
| 12 | 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 |
| 13 | 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 |
| 14 | Rickettsia and Chlamydia. 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. Prions. | 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 |
| 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. EDUCATIONAL-METHODICAL AND INFORMATION SUPPORT OF DISCIPLINE Микробиология, вирусология

### a) List of recommended literature

**general**:


1) Artamonova, M. N. Medical Microbiology, Virology and Immunology. Lecture Notes : textbook / Artamonova M. N. , Potaturkina-Nesterova N. I. , Ilyina N. A. , Nemova I. S. - Москва : ГЭОТАР-Медиа, 2021. - 352 с. - ISBN 978-5-9704-6043-6. - Текст : электронный // ЭБС "Консультант студента" : [сайт]. - URL : https://www.studentlibrary.ru/book/ISBN9785970460436.html

2) Zverev, V. V. Medical Microbiology, Virology, Immunology : textbook : Vol. 2. / eds. V. V. Zverev, M. N. Boichenko. - Москва: ГЭОТАР-Медиа, 2020. - 392 с. - ISBN 978-5-9704-5719-1. - Текст: электронный // ЭБС "Консультант студента": [сайт]. - URL : https://www.studentlibrary.ru/book/ISBN9785970457191.html

3) Cases in Medical Microbiology: diagnostic methods, treatment and prophylaxis of infectious diseases / M. N. Artamonova, N. I. Potaturkina-Nesterova, I. S. Nemova, A. S. Khitrova; Ulyanovsk State University, Insitute of Medicine, Ecology and Physical culture. - Ulyanovsk: ULSU, 2020. – Текст на англ. яз.; Загл. с экрана. - Электрон. текстовые дан. (1 файл : 789 КБ). - Текст: электронный. http://lib.ulsu.ru/MegaPro/Download/MObject/3997


**additional**:


1) General microbiology: classification, morphology and ultrastructure of microorganisms : manual for foreign students of medical faculty / M. 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 / M. 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 / 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

4) Methods of laboratory research in Microbiology : электронный учебный курс / М. Н. Артамонова, Н. И. Потатуркина-Нестерова, И. С. Немова, А. С. Хитрова. - Ульяновск :УлГУ, 2019. - URL: https://portal.ulsu.ru/course/view.php?id=91713 . – Режим доступа: Портал ЭИОС УлГУ. - Текст : электронный.


**educational methodological**:


1) **Artamonova M. N.** Guidelines for students' self-guided work for the discipline «Microbiology, virology» for specialty 31.05.01 «General medicine». Part 2 / M. N. Artamonova, N. I. Potaturkina-Nesterova; Ulyanovsk State University. - Ulyanovsk : ULSU, 2022. - 27 p. - Неопубликованный ресурс; На англ. яз. - URL: http://lib.ulsu.ru/MegaPro/Download/MObject/11553 . - Режим доступа: ЭБС УлГУ. - Текст : электронный.

2) **Artamonova M. N.** Guidelines for students' self-guided work for the discipline «Microbiology, virology» for specialty 31.05.01 «General medicine». Part 1 / M. N. Artamonova, N. I. Potaturkina-

Nesterova; Ulyanovsk State University. - Ulyanovsk : ULSU, 2022. - 32 p. - Неопубликованный ресурс; На англ. яз. - URL: http://lib.ulsu.ru/MegaPro/Download/MObject/11552 . - Режим доступа: ЭБС УлГУ. - Текст : электронный.

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*Профессиональные базы данных, информационно-справочные системы*

**1. Электронно-библиотечные системы:**

1.1. Цифровой образовательный ресурс IPRsmart : электронно-библиотечная система : сайт / ООО Компания «Ай Пи Ар Медиа». - Саратов, [2024]. – URL: http://www.iprbookshop.ru. – Режим доступа: для зарегистрир. пользователей. - Текст : электронный.

1.2. Образовательная платформа ЮРАЙТ : образовательный ресурс, электронная библиотека : сайт / ООО Электронное издательство «ЮРАЙТ». – Москва, [2024]. - URL: https://urait.ru . – Режим доступа: для зарегистрир. пользователей. - Текст : электронный.

1.3. База данных «Электронная библиотека технического ВУЗа (ЭБС «Консультант студента») : электронно-библиотечная система : сайт / ООО «Политехресурс». – Москва, [2024]. – URL: https://www.studentlibrary.ru/cgi-bin/mb4x. – Режим доступа: для зарегистрир. пользователей. – Текст : электронный.

1.4. Консультант врача. Электронная медицинская библиотека : база данных : сайт / ООО «Высшая школа организации и управления здравоохранением-Комплексный медицинский консалтинг». – Москва, [2024]. – URL: https://www.rosmedlib.ru. – Режим доступа: для зарегистрир. пользователей. – Текст : электронный.

1.5. Большая медицинская библиотека : электронно-библиотечная система : сайт / ООО «Букап». – Томск, [2024]. – URL: https://www.books-up.ru/ru/library/ . – Режим доступа: для зарегистрир. пользователей. – Текст : электронный.

1.6. ЭБС Лань : электронно-библиотечная система : сайт / ООО ЭБС «Лань». – Санкт-Петербург, [2024]. – URL: https://e.lanbook.com. – Режим доступа: для зарегистрир. пользователей. – Текст : электронный.

1.7. ЭБС Znanium.com : электронно-библиотечная система : сайт / ООО «Знаниум». - Москва, [2024]. - URL: http://znanium.com . – Режим доступа : для зарегистрир. пользователей. - Текст : электронный.

**2. КонсультантПлюс** [Электронный ресурс]: справочная правовая система. / ООО «Консультант Плюс» - Электрон. дан. - Москва : КонсультантПлюс, [2024].

**3. eLIBRARY.RU**: научная электронная библиотека : сайт / ООО «Научная Электронная Библиотека». – Москва, [2024]. – URL: http://elibrary.ru. – Режим доступа : для авториз. пользователей. – Текст : электронный

**4. Федеральная государственная информационная система «Национальная электронная библиотека»** : электронная библиотека : сайт / ФГБУ РГБ. – Москва, [2024]. – URL: https://нэб.рф. – Режим доступа : для пользователей научной библиотеки. – Текст : электронный.

**5. Российское образование** : федеральный портал / учредитель ФГАУ «ФИЦТО». – URL: http://www.edu.ru. – Текст : электронный.

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

Инженер ведущий Щуренко Ю.В. 2024

## 12. EDUCATIONAL FACILITIES

| | |
|---|---|
| Room № 1 is used for conducting workshops, tutorials, for formative and summative assessment and equipped to demonstrate visual aids designed to implement the syllabus. The room is furnished with a set of student furniture seating 16 people. The 35 square meter room is equipped with a blackboard, fluorescent lamps on each desk, UV lamp for sterilization, sink with tap, lab cupboard for dishes. There are 8 individual places equipped with laboratory tools and dishes necessary for microbiological manipulations: light microscope, clean glass slides, laboratory tray, wash bottles with sterile distilled water, loop, tubes with physiological solution, test tubes with bacterial pure culture, spirit lamp, set of dyes: crystal violet, fuchsine), iodine, pipettes, sets disks with antibiotics, diagnostic preparations: vaccines, sera, bacteriophages. | 4, Surova Street, Ulyanovsk, the Ulyanovsk Region (City Clinical Hospital №1) |
| Room № 2 is used for conducting workshops, tutorials, for formative and summative assessment and equipped to demonstrate visual aids designed to implement the syllabus. The room is furnished with a set of student furniture seating 16 people. The 39 square meter room is equipped with a blackboard, fluorescent lamps on each desk, UV lamp for sterilization, sink with tap, lab cupboard for dishes. There are 8 individual places equipped with laboratory tools and dishes necessary for microbiological manipulations: light microscope, clean glass slides, laboratory tray, wash bottles with sterile distilled water, loop, tubes with physiological solution, test tubes with bacterial pure culture, spirit lamp, set of dyes: crystal violet, fuchsine), iodine, pipettes, sets disks with antibiotics, diagnostic preparations: vaccines, sera, bacteriophages. | 4, Surova Street, Ulyanovsk, the Ulyanovsk Region (City Clinical Hospital №1) |
| Room №3 is used for storage of lab dishes, equipment and bacterial culture. It is equipped with fridge, thermostat for cultivation of bacteria, anaerobic jar for cultivation of anaerobic bacteria, UV lamp and lab cupboards for dishes. | 4, Surova Street, Ulyanovsk, the Ulyanovsk Region (City Clinical Hospital №1) |

## 13.OPTIONS FOR STUDENTS WITH DISABILITIES

Training students with disabilities is carried out taking into account the peculiarities of psychophysical development, individual capabilities and health of such students. Education of students with disabilities can be organized in conjunction with other students, and separately. If necessary, students from among persons with disabilities (at the request of the student) may be offered one of the following options for the perception of information, taking into account their individual psychophysical characteristics:

- for persons with visual impairment: in printed form in large print; in the form of an electronic document; in the form of an audio file (translation of educational materials into audio format); in printed form in Braille; individual consultations with the involvement of a sign language interpreter; individual tasks and tutorials.
- for persons with hearing disabilities: in printed form; in the form of an electronic document; video materials with subtitles; individual consultations with the assistance of a sign language interpreter; individual tasks and tutorials.

- for persons with musculoskeletal disorders: in printed form; in the form of an electronic document; in the form of an audio file; individual tasks and tutorials.

Course designer _____Associate Professor at the Department of General and Clinical Pharmacology with Microbiology course

Signature job title

Artamonova M.N.

name

Course designer _____Professor at the Department of General and Clinical Pharmacology with Microbiology course

Signature job title

Potaturkina-Nesterova N.I.