

**PRIVATE HIGHER EDUCATIONAL ESTABLISHMENT
«INTERNATIONAL ACADEMY OF ECOLOGY AND MEDICINE»**

Department of fundamental disciplines with a course of pharmacology

**SYLLABUS OF THE EDUCATIONAL
DISCIPLINE**

" Microbiology, virology and immunology "

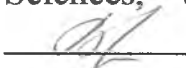
LEVEL OF HIGHER EDUCATION The second (master's) level

DEGREE OF HIGHER EDUCATION Master

AREA OF KNOWLEDGE 22 "Health care"

SPECIALTY 221 "Dentistry"

Reviewed and approved
at the meeting of the Department of fundamental
disciplines with a course of pharmacology

Protocol № 1 of « 01 » 09 2020
Head of the department Doctor of Biological
Sciences, associate professor
 M.R. Vergolyas

Kiev 2020

1. General information	
Subject	Microbiology, virology and immunology
Lector	Ph.D. A. Pogribna
Teacher's contact phone number	066 272-75-70
Teacher's e-mail	pogr@ukr.net
Discipline format	Normative discipline.
The volume of the discipline	150 hours
Link to the distance learning site	maem.kiev.ua
Consultations	Tuesday of each week 16.00-17.30
2. Annotation to the course	
<p>The subject of study of the discipline "Microbiology, virology and immunology" is the structural basis of human diseases for in-depth study of the fundamentals of medicine and the clinical picture of diseases with the subsequent use of knowledge in the practice of medicine.</p> <p>Microbiology (from the Greek. Micro - small, bios - life, logos - science) - is the science of very small, invisible for the naked eye living beings called microorganisms or microbes, their taxonomy, morphology and physiology, ecology and relationships with other living organisms.</p> <p>The subject of study for the discipline is the properties of pathogenic representatives of the world of microbes, their interaction with the human body, the mechanisms of development of infectious diseases, methods of their diagnosis, specific prevention and treatment. .</p>	<p>Interdisciplinary links. Discipline "Microbiology, virology and immunology" is based on knowledge of basic natural sciences: medical biology, medical and biological physics, biological and bioorganic chemistry, human anatomy, histology, cytology and embryology, Latin, history of medicine, philosophy, and integrates with these disciplines.</p>
3. Purpose and objectives of the course	
<p>The purpose and objectives of the discipline: <i>the purpose of studying the discipline is:</i> knowledge of the properties of pathogenic representatives of the world of microbes, their interaction with the human body, the mechanisms of development of infectious diseases, methods of their diagnosis, specific prevention and treatment.</p>	<p>The goals of training of the discipline:</p> <ul style="list-style-type: none"> – To interpret the biological properties of pathogenic and non-pathogenic microorganisms, viruses and patterns of their interaction with the host, human population and the environment. – To determine methods of microbiological and virological diagnostics, etiotropic therapy and specific prevention of infectious diseases. – To explain the structure of the immune system of the human body.

- To interpret the main mechanisms of formation of the immune response of the human body.
- To identify the main types of pathological reactions of the immune system and the relationship with the occurrence of the most common human diseases.

4. Competencies and learning outcomes

As a result of learning of of the discipline student have to

know:

In a medical institution, using a standard procedure, using knowledge about the person, his organs and systems, based on the results of laboratory and instrumental studies to assess information about the diagnosis:

- Serological reactions in infectious diseases of inflammatory profile;
- Microbiological study of biological fluids and secretions;
- Bacteriological study of food and water quality.

be able:

- Evaluate the results of laboratory and instrumental research;
- Anticipate the negative effects of dangerous factors on the human body;
- Master the modern methods of microbiological research in infectious diseases;
- Analyze the principles of obtaining vaccines, methods of their standardization and control, practical use;
- Master the principles of production of immune sera, methods of their standardization, control, practical significance;
- Interpret the development of medicine in historical retrospect;
- Interpret the main historical and medical events;
- Demonstrate mastery of moral and ethical principles of attitude to a living person, his body as an object of anatomical and clinical research.

In accordance with the requirements of the standard, the discipline provides students with the acquisition of competence:

- *integral*: - Ability to solve typical and complex specialized tasks and practical problems in professional activities in the field of health care, or in the learning process, which involves microbiological research and / or implementation of an innovation and is characterized by complexity and uncertainty of conditions and requirements.
- *common*: - Ability to apply knowledge in practical situations. Ability to effectuate selfregulation, to have a healthy lifestyle, ability to adapt and act in a new situation. Ability to choose a communication strategy; ability to work in a team; interpersonal interaction. Skills in the use of information and communication technologies. Ability to abstract thinking, analysis and synthesis, the ability to learn and to be trained modernly. Definiteness and persistence in terms of tasks and responsibilities. Ability to act socially responsibly and with public awareness. The desire to preserve the environment. Universal competencies that do not depend on the subject area, but are important for the successful further professional and social activities of the applicant in various fields and for his personal development.
- *special (professional, subjective)*: - Ability to evaluate the results of laboratory and instrumental research. Ability to carry out sanitary and hygienic preventive measures. Ability to plan preventive and anti-epidemic measures for infectious diseases. Ability to analyze of the state, social, economic and medical information. Ability to assess the impact of socio-economic and biological determinants on the health of the individual, family, population. Ability to apply

scientifically substantiated psychological methods of effective work with colleagues, medical staff, patients and their relatives, readiness to interact with other people. Awareness of the individual in the culture of other peoples.

Matrix of competencies

№	Competence	Knowledge	Skills	Communication	Autonomy and responsibility
1.	Ability to apply knowledge in practical situations	To have specialized conceptual knowledge acquired in the learning process.	To be able to solve complex problems and problems that arise in professional activities.	Clear and unambiguous reporting of own conclusions, knowledge and explanations that substantiate them to specialists and non-specialists.	Responsible for making decision in difficult conditions
2.	Ability to evaluate laboratory and instrumental results research	To have specialized knowledge about the human, his organs and systems, to know the standard methods of laboratory and instrumental research: Serological reactions in infectious diseases; Rapid tests for viral diseases Amplification methods for infectious diseases; Serological reactions in autoimmune diseases; Chemical and bacteriological	To be able to analyze the results of laboratory and instrumental studies and on their basis to evaluate information about the patient's diagnosis	To appoint and to evaluate the results of laboratory and instrumental research reasonably.	To be responsible for making a decision on evaluation of laboratory and instrumental research results
		studies of biological fluids and secretions).			

3.	Ability to plan preventive and anti-epidemic measures for infectious diseases	To know the principles and systems of planning preventive and anti-epidemic measures for infectious diseases in typical conditions and in conditions of epidemic trouble on the basis of the analysis results, data of inspection in the centers of the outbreaks of infectious diseases. To know the preventive and anti-epidemic methods of organizing measures to prevent the spread of infectious diseases.	To be able to plan (make plans) measures to prevent the spread of infectious diseases on the basis of epidemiological analysis, using preventive and anti-epidemic methods	To inform the population, heads of relevant institutions and enterprises about the opportune implementation of preventive and anti-epidemic measures, vaccinations, etc.	To be responsible for the qualitative analysis of indicators of infectious morbidity of the population, timely carrying out of the corresponding preventive and anti-epidemic measures.
4.	Ability to carry out preventive and anti-epidemic measures against infectious diseases	To know the principles of organizing and conducting a system of preventive and anti-epidemic measures for infectious diseases and	To be able to organize preventive and anti-epidemic measures for infectious diseases in health care facilities, among the population	To inform the heads of health care institutions, local authorities about the epidemic situation and the need for timely and highquality preventive and anti-epidemic	To be responsible for the quality and timeliness of early diagnosis of infectious diseases, the organization of effective preventive and anti-epidemic measures to

		preventing their spread in typical conditions and during the exacerbation of the epidemic situation. To know the methods of detection and early diagnosis of infectious diseases, the organization of primary antiepidemic measures in the center of infectious diseases.	and in the centers of infectious diseases based on the epidemiological analysis by risk groups, risk areas, time and risk factors.	measures of diseases in the health care institution, among the population and in the centers of the outbreaks of infectious diseases.	prevent the spread of infectious diseases.
5.	Ability to process state, social, economic and medical information	To know standard methods, including modern computer information technologies, processing of state, social and medical information	Ability to determine the source of finding the necessary information depending on its type; ability to conduct statistical processing of material and analysis of the received information	To form conclusions on the basis of the analysis and statistical processing of the received information	To be responsible for high-quality and opportune execution of statistical processing and analysis of the received information
6.	Ability to assess the impact of socio-economic and biological determinants on the health of the individual, family, population	To know the socioeconomic and biological determinants that affect public health; types and methods of prevention to	To be able to calculate indicators of public health based on epidemiological and medical-statistical research.	To obtain the necessary information from identified sources concerning the health of the population and its individual groups and formulate conclusions	To be responsible for the validity of preventive measures to prevent the negative impact of socio-economic factors on the health of the

		prevent the negative impact of socioeconomic factors on the health of the population and its individual groups	To be able to assess the relationship and impact of socioeconomic and biological factors on the health of the individual, family, health population. To be able to plan preventive measures to prevent the negative impact of socioeconomic factors on the health of the population and its individual groups.	regarding the impact of socioeconomic and biological factors on public health	population and its individual groups
7.	Ability to apply intellectual capabilities and knowledge when working with the patient	To know the world view: function of bioethics in the formation of civil society and historical aspects of the concept of "human rights"	To be able to detect potential threats of the nature of living organisms	To get the necessary medical, social, special information	To make effective decisions, including in extreme conditions, and to be responsible for them
8.	Ability to provide medical, ethical and legal assessment of specific cases from the position of confidentiality and medical secrecy in solving situational problems for patients with HIV.	To know the Law of Ukraine "On counteracting the spread of diseases caused by the human immunodeficiency virus (HIV), legal and social protection of infectious diseases.	To consider the diversity of human and citizen rights	To apply norms and principles of biomedical ethics and deontology	To be responsible for saving of medical confidentiality.

5. Organization of course training			
<i>The volume of the course</i>			
Type of lesson	<i>Total amount of hours</i>		
Lectures	40		
Practical classes	70		
Independent work	40		
<i>Course signs</i>			
Semesters: the 3rd, the 4th	Specialty 221 "Dentistry"	Course (year of study) :the 2 nd	Normative discipline
<i>Course thematics</i>			
The program of the discipline is structured into 2 modules:			
<u>Module 1. Morphology and physiology of microorganisms. Infection. Immunity.</u>			
<i>Content module 1. In trodution to microbiology.</i>			
<i>Content module 2. Morphology and structure of prokaryotes and parasitic unicellular eukaryotes. Staining of microorganisms . Microscopy.</i>			
<i>Content module 3. Physiology of microorganisms (prokaryotes). Evolution and classification of microorganisms.</i>			
<i>Content module 4. Genetics of microorganisms.</i>			
<i>Content module 5. Microbiologic al bases of antimicrobial chemotherapy.</i>			
<i>Content module 6. Infection.</i>			
<i>Content module 7. The body's immune system . Reacti ons of nonspecific protection of an organism against microorganisms.</i>			
<i>Content module 8. Antigens. Antibodies.</i>			
<i>Content module 9. Immunity react ions. Immunopathology.</i>			
<u>Module 2. Special, clinical and ecological microbiology. Special Virology.</u>			
<i>Content module 10. Pathogenic prokaryotes and eukaryotes.</i>			
<i>Content module 11. Special virology.</i>			
<i>Content module 12. Fundamentals of clinical and environmental microbiology.</i>			

THEMATIC PLAN OF LECTURES
The 3rd semester

Nº	TOPIC	Hours
	Module I. Morphology and physiology of microorganisms. The infection an immunity.	
1	Value of medical microbiology in practical activity of doctor. Original methods of microbiological research. Evolution and classification of microorganisms. Morphology of microorganisms. Microbes have chemical composition and metabolism. Height and reproduction of microorganisms.	2
2	Chemotherapeutic preparations. Antibiotics. Studies are about an infection.	2

3	History of development of immunology. Heterospecific factors of defence. Immune system of organism. Antigens.	2
4	Antibodies, structure. Classes of immunoproteins. Cooperation of cells of the immune system in an immune answer.	2
5	Immunopathological reactions. Immunoprophylaxis and immunotherapy.	2
6	Pathogenic cocci.	2
7	Pathogenic enterobacteria.	2
8	Pathogens of diphtheria.	2
9	Pathogens of tuberculosis.	2
10	Pathogens of anaerobic infections. Pathogenic spirochetes.	2
Total:		20

The 4th semester

№	TOPIC	Hours
	Module II. Special, clinical and ecological microbiology. Special Virology.	2
1	General virology. Morphology and ultrastructure of viruses. Cultivation of viruses.	2
2	RNA genomic viruses. General characteristics. Orthomyxoviruses. Paramyxoviruses. Picornaviruses.	2
3	Retroviruses, general description. Oncoviruses. HIV.	2
4	Viruses of hepatitis.	2
5	DNA genomic viruses. General characteristics. Adeno- and herpesviruses.	2
6	General characteristics of the microbiocenosis of the oral cavity. The main groups of microorganisms that colonize periodontal tissues.	2
7	Immune system of the oral cavity. Immunopathological processes in the oral cavity.	2
8	Fundamentals of clinical microbiology of periodontitis and dental diseases.	2
9	Viral infections of the oral cavity.	2
10	Microbiological basis of antimicrobial therapy.	2
Total:		20

THEMATIC PLAN OF PRACTICAL CLASSES

The 3rd semester

№	TOPIC	Hours
	Module I. Morphology and physiology of microorganisms. The infection and immunity.	
1	Structure of bacteriological laboratory. Dyes. Simple methods of staining.	2
2	Gram staining method.	2
3	Morphology and structure of bacteria.	2
4	Morphology of Fungi, Actinomycetes, Spirochaetes.	2
5	Bacterial physiology. Nutrient media for cultivation of bacteria. Sterilization and disinfection.	2
6	Isolation of pure culture of bacteria (part 1).	2

7	Isolation of pure culture of bacteria (part 2).	2
8	Isolation of pure culture of bacteria (part 3).	2
9	Nonspecific host protection from microorganisms.	2
10	Serological tests (part 1).	2
11	Serological tests (part 2).	2
12	Serological tests with labels.	2
13	Vaccines and immune serums.	2
14	Immunopathology. Assessment of immune status of the organism.	2
15	Final module control 1	2
	Total:	30

The 4th semester

№	Topic	Hours
	Module 2. Special, clinical and ecological microbiology. Special Virology	
1.	Staphylococci and Streptococci. Microbiological diagnostics of diseases caused by Staphylococci and Streptococci.	2
2.	Meningococci. Microbiological diagnostics of meningococcal diseases. Gonococci. Microbiological diagnostics of meningococcal diseases.	2
3.	Escherichia. Microbiological diagnostics of the diseases caused by E.coli.	2
4.	Salmonella. Microbiological diagnostics of salmonella gastroenteritis.	2
5.	Corynebacteria. Microbiological diagnostics of diphtheria.	2
6.	Mycobacteria. Microbiological diagnostics of tuberculosis.	2
7.	Pathogenic agents of anaerobic infections. Microbiological diagnostics of anaerobic wounds infection.	2
8.	Spirochaetes. Microbiological diagnostics of Syphilis.	2
9.	Pathogenic fungi. Microbiological diagnostics of mycoses.	2
10.	Clinical microbiology (1 lesson).	2
11.	Morphology and ultrastructure of viruses. Cultivating of viruses. Indication of viral reproduction.	2
12.	Serological reactions in virology.	2
13.	Retroviruses. HIV. Laboratory diagnosis of HIV infection.	2
14.	Pathogens of viral hepatitis. Laboratory diagnosis of hepatitis A and E.	2
15.	Pathogens of viral hepatitis. Laboratory diagnosis of hepatitis B, C, D.	2
16.	Herpesviruses. Laboratory diagnosis of herpes virus infections.	2
17.	Adenoviruses. Laboratory diagnosis of adenoviral infections. Poxviruses.	2
18.	Oncoviruses.	2
19.	Final control of practical skills.	2
20.	Final module control 2.	2
	Total	40

THEMATIC PLAN OF INDEPENDENT WORK OF STUDENTS (IWS)

The 3rd semester

№	MODULE 1 TOPIC	Hours	Type of control
1	Preparation for practical classes - theoretical preparation and working off the practical skills.		Current control in practical classes

2	Elaboration of topics that are not included in the lesson plan:		
2.1	Dependence of the results of dyeing of microorganisms on their properties.	2	Final modular control
2.2	Test system for determining the enzymatic activity of microorganisms.	2	-“-
2.3	The origin and evolution of microorganisms. Basic principles of taxonomy of microorganisms.	2	-“-
2.4	Genetics of microorganisms.	2	-“-
3.	Preparation for the final modular control	2	<i>Final modular control</i>
	Total	10	

The 4th semester

№	MODULE 2 TOPIC	Hours	Type of control
1.	Preparation for practical classes - theoretical preparation and working off the practical skills.	16	Current control in practical classes
2	Elaboration of topics that are not included in the lesson plan:		
2.1	Modern test systems for determining the sensitivity of microbes to antibiotics.	2	
2.2	Hypersensitivity of immediate and delayed type, their mechanisms, differences. Practical meaning	2	
2.3	Modern test systems for determining the sensitivity of microbes to antibiotics.	2	Final modular control
2.4	Hypersensitivity of immediate and delayed type, their mechanisms, differences. Practical meaning	2	-“-
2.5	History of discovery and the main stages of the development of virology. Contribution of domestic scientists. Methods of studying viruses, their evaluation.	2	-“-
2.6	Prospective directions for effective influenza vaccines obtaining.	2	-“-
3	Preparation for the final modular control	2	<i>Final modular control</i>
	Total	30	

THE LIST OF THEORETICAL QUESTIONS FOR PREPARATION OF STUDENTS TO THE FINAL MODULAR CONTROL.

1. Definition of microbiology as a science. Fields of microbiology. Subject and tasks of medical microbiology. The main features and trends of modern microbiology.
2. Discovering of the microorganisms by Antonie van Leeuwenhoek. Stages of the microbiology development. The contribution of Louis Pasteur and Robert Koch to microbiology.
3. Formation of the major directions of microbiological science. Role of D. Samoilovych, E. Jenner, I.I. Mechnikov, D.Y. Ivanovskiy, P. Ehrlich, S.M Vinogradskiy, E. Behring, G. Ramon,

F.A. Losch, G. Domagk, A. Fleming, D.K. Zabolotniy, L.A. Zilber, V.M. Zhdanov, M.P. Chumakov, F. Burnett and other scientists. The development of microbiology in the Ukraine.

4. The main differences between prokaryotes and eukaryotes. Forms of bacteria with the cell wall synthesis defect, protoplasts, spheroplasts. L-form of bacteria.
5. Morphology and structure of bacteria. The role of separate structures for the life of bacteria in the pathogenesis of infectious diseases. Vegetative forms and spores.
6. Morphology and classification of protozoa.
7. Classification and morphology of fungi.
8. The methods of microscopy. Production of bacteriological slides. Dyes and staining solution, simple and complex methods of painting.
9. The principles of organization, equipment and operating mode in bacteriological, serological and virological laboratories.
10. Bacterioscopic method. Stages.
11. Types and mechanisms of microorganisms nutrition. Mechanisms of penetration of nutrients into bacterial cells. The chemical composition of microorganisms. The value of the components. Growth media and requirements for them. Classification of growth media, which are used in microbiology.
12. Respiration of microorganisms. Aerobic and anaerobic types of respiration. Enzymes and structures of the cells involved in the process of respiration. Methods of cultivation of anaerobic bacteria.
13. Enzymes of microorganisms and their role in metabolism. Role of enzymes in differentiation of bacteria. Enzymes pathogenicity.
14. Growth and ways reproduction of bacteria. The mechanism of cell division, phases of bacteria culture multiplication in stationary conditions.
15. Bacteriological method. Principles of isolation of pure cultures of bacteria and their identification.
16. Influence of physical, chemical and biological factors on microorganisms. Methods of sterilization. Control of the effectiveness of sterilization. Asepsis. Antiseptics.
17. Origin and evolution of microorganisms. Modern classification of prokaryotes. Main taxonomic ranks. Taxonomy and nomenclature of bacteria. Species as basic taxonomic rank.
18. Taxonomy and nomenclature of bacteria. Basic principles of systematics. Classification of bacteria. Characteristics of the species.
19. The material basis of heredity of microorganisms. Genotype and phenotype. Types of variability. Non-hereditary variability.
20. Hereditary variability. Mutations and their variations. Physical, chemical, biological mutagens. Genetic recombination: transformation, transduction, conjugation. Dissociation of bacteria.
21. Nonchromosomal heredity factors of bacteria. Plasmids and their basic genetic functions. Migratory elements. The role of mutation, recombinations and selection in the evolution of microbes. The main factors of evolution.
22. The value of genetics in the development of general and medical microbiology, virology and molecular biology. Microbiological basis of genetic engineering. The scheme of gene structures and genetically modified organisms production. Achievement of genetic engineering, the use genetically engineered drugs in medicine.
23. Chemotherapy and chemotherapeutic preparations. Chemotherapeutic index. The mechanism of antibacterial action of sulfonamides. The role of P. Ehrlich and G. Domagk in the development of the chemotherapy doctrine.
24. The phenomenon of microbes antagonism. The role of national microbiologists in the development of the microbes antagonism doctrine. Antibiotics, characteristics, principles of producing, units of measurement. Classification by mechanism of action on microorganisms.
25. Drug-resistant microbes, the mechanism of resistant forms formation. Methods of determining the sensitivity of microbes to antibiotics. Minimum inhibitory (MIC) and minimum bactericidal (MBC) concentration. Practical value. How to combat with drug-resistant microorganisms.

26. Infection. Factors that determine the origin of infectious process. The role of microorganisms in the infectious process. Pathogenicity, virulence, measurement units, methods of determination. Factors of microorganisms pathogenicity, their characteristics.
27. Toxins of microbes (exo-and endotoxins). Properties and chemical composition, receiving, measuring of exotoxins potency. Role in the pathogenesis and immunogenesis of infectious diseases.
28. Phases of infectious process. Mechanisms of infection by pathogenic microorganisms. Bacteremia, toxinemia, sepsis. Periods of infectious disease.
29. Macroorganism role in the infectious process. Immunological reactivity of the organism of the child. Influence of environmental and social conditions in origin and development of infectious process in humans. Persistence of bacteria and viruses. The concept of relapse, reinfection, superinfection.
30. The doctrine of immunity. Stages of development of immunology. Types of immunity and its forms of manifestation.
31. Nonspecific factors of the organism protect from pathogenic microbes. Complement, its properties, ways of activation. Cytokines. Phagocytosis, phagocytic cell types. Stages of phagocytosis. Completed and incomplete phagocytosis.
32. The immune system of the organism and its organs. The role of the thymus in the immune response. Cells of the immune system, their types, the interaction of T-, B-lymphocytes and macrophages. Their role in the cellular and humoral immunity.
33. Regularities of immune response. Phases of the immune response. Immunological reactions. Immunological tolerance, reasons for its occurrence. Immunological memory and its mechanism.
34. Immediate and delayed hypersensitivity types, their mechanisms, the differences. Practical value.
35. Three cells cooperation system of the immune response. The role individual immune system cells and their interaction. Interleukins.
36. Antigens and their characteristics. Full and defective antigens. Antigenic structure of bacteria. Practical value of the study about microbial antigens. Autoantigen.
37. Antibodies, their nature. Place of synthesis, the dynamics of production of antibodies. Autoantibodies.
38. Antitoxins, their properties, mechanism of action. Principles of receiving of antitoxic serums. Units of measurement, practical use.
39. Serological reactions, their characteristics, main types, practical use. Agglutination reaction, its mechanism and types. The practical use.
40. Serological tests. Precipitation reaction and its mechanism. Use in medical practice. Gel precipitation test.
41. Serological tests. Reactions of lysis. Complement fixation test, its practical use.
42. Reactions with labeled antibodies or antigens. Practical use of immunofluorescence reaction (IFR), ELISA and radioimmune assay.
43. Forms and types of immune response. Humoral immune response and its stages.
44. Primary and secondary immune response. Interaction of immune system cells in the immune response process.
45. Reactions of the immune response, their characteristics. Cellular immune response.
46. Immediate and delayed hypersensitivity types. The mechanism of these reactions. .
47. Monoclonal antibodies, their production and use in medical practice.
48. Immunodeficiency conditions, autoimmune processes. Complex evaluation of the immune status of the organism.
49. Live vaccines, the principles of their production. Control, the practical use of live vaccines, evaluation of effectiveness.
50. Vaccines. History of receipt. Classification of vaccines. Corpuscular, chemical, synthetic, genetically engineered and antiidiotypic vaccines.
51. Chemical vaccines and toxoids, principles of receipt. Associated vaccine. Adsorbed vaccine, the principle of "repository".

52. Toxoids, their reception, cleaning, measurement units, evaluation and the practical use.
53. Corpuscular vaccine from killed microbes. Principles of receipt, control of, evaluation of effectiveness.

PRACTICAL SKILLS FOR FINAL MODULE CONTROL

1. Microscope preparation ,to conduct the color method ,morphology and properties of tinctorial bacteria. (Preparations for microscopy: 1) Staphylococcus, 2) streptococcus, 3) monobacterias Gr , 4) capsular bacteria, 5) spores by Ozeshko, 6) spores by Peshkov, 7) spores by Gram, 8), yeast fungi, 9) incomplete phagocytosis diplococcus).
2. Make the preparation of culture of bacteria grown on dense media, stain by GramSynov. Microscope, determine the morphology and tinctorial properties.
3. Make the preparation of culture of bacteria grown on dense nutrient medium, staining by the simple method. Microscope, conduct the morphology.
4. Make the preparation of patient specimens, stain by Ziehl-Nielsen, microscope, conduct the morphology.
5. Principal structure and mechanism of action of Endo media. Practical application.
6. Principal structure and mechanism of action of Levin media. Practical application.
7. Principal structure and mechanism of action Ploskyrev media. Practical application.
8. Practical application of Kitt-Tarozzi media, a principal structure and mechanism of action. Practical application.
9. Conduct consideration of biochemical properties of selected clean cultures of bacteria. Make a conclusion.
10. To identify the sensitiveness of culture of staphylococcus to antibiotics using diagnostic discs. Conduct consideration, to make a conclusion.
11. To identify the minimum inhibitory concentrations of cefazolin for Staphylococcus aureus cultures by the method of serial dilutions. Conduct consideration, to make a conclusion.
12. Set reaction of termoringprecypitation by Ascoli to detect antigens of anthrax pathogen in tested extract of animal raw materials. Conduct consideration, to make a conclusion.
13. Set agglutination reaction on glass with an unknown culture and typhoid diagnostic agglutinated serum. Conduct consideration, to make a conclusion.
14. CBT with serum patient and gonococcal diagnostics, to make a conclusion
15. Describe the cultural properties of bacteria on nutrient dense medium.
16. Determine the titer of saliva lysozyme by the method of serial dilutions.
17. Make consideration and estimate the results of gel precipitation test, set to determine the toxigenicity studied cultures of corynebacteria diphtheria.
18. Conduct consideration and estimate the results of extended agglutination test with serum of the patient and typhoid diagnostics.
19. Conduct consideration and estimate the results of indirect hemagglutination reaction, the set of patient serum and erythrocyte diagnostics.
20. Conduct consideration and estimate the results of enzyme immunoassay (ELISA) for detection of antibodies to antigens of excitation manual pages of syphilis.

6. Course evaluation system

<p>General course evaluation system</p>	<p>Current control is performed based on the control of theoretical knowledge, skills and abilities in practical classes. Independent study students are assessed in practical classes, and is an integral part of the final grade of the student. Current control is performed during the training sessions and aims at checking the assimilation of students learning the material. Forms of current control are:</p> <p>a) test tasks with a choice of one correct answer, with the definition of the correct sequence of actions, with</p>
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determination of the conformity, defining the specific portion of the photo or diagram ("detection");
 b) individual oral questioning, interview;
 c) the solution of typical situational tasks;
 g) identification of pathogens and carriers of pathogens of parasitic diseases in the photographs, macro - and micropreparats;
 d) control of practical skills;
 e) the typical problems of genetics and medical genetics.

Grades on the national scale ("excellent" - 5, "good" - 4, "satisfactory" - 3, "unsatisfactory" - 2), received by students, are displayed in the journals of attendance and academic group performance.

Final control

The final control is the form of a differentiated credit at the end of the 1st semester and an exam at the end of the 2nd semester upon completion of the course of medical biology.

The semester exam is a form of final control of mastering by the student of theoretical and practical material on academic discipline. The final control (exam) is carried out at the last control lesson.

Students are admitted to the FC who have attended all the classes provided by the curriculum in the discipline and while studying the module scored the number of points not less than the minimum (72 points). A student who, for good or bad reasons, has missed classes, is allowed to rework academic debt for a certain period of time.

Evaluation of current educational activities. During the assessment of mastering each topic for the current educational activity of the student scores are set on a 4-point (national) assessment scale. This takes into account all types of work provided by the discipline program. The student must receive a score on each topic. Scores on the traditional scale are converted into points. The final assessment of the current academic activity is the arithmetic mean (the sum of scores for each lesson is divided by the number of lessons per semester) and translated into points according to Table 2.

Table 2. Conversion of the average score for the current activity into a multi-point scale (for disciplines completed by diff.credit, exam)

4-point scale	120-point scale	4-point scale	120-point scale	4-point scale	120-point scale	4-point scale	120-point scale
5	120	4,45	107	3,91	94	3,37	81
4,95	119	4,41	106	3,87	93	3,33	80
4,91	118	4,37	105	3,83	92	3,29	79
4,87	117	4,33	104	3,79	91	3,25	78
4,83	116	4,29	103	3,74	90	3,2	77
4,79	115	4,25	102	3,7	89	3,16	76

4,75	114	4,2	101	3,66	88	3,12	75
4,7	113	4,16	100	3,62	87	3,08	74
4,66	112	4,12	99	3,58	86	3,04	73
4,62	111	4,08	98	3,54	85	3	72
4,58	110	4,04	97	3,49	84	<3	Not enough
4,54	109	3,99	96	3,45	83		
4,5	108	3,95	95	3,41	82		

The maximum number of points that a student can collect for current educational activity during semester in order to be admitted to the exam is 120 points.

The minimum number of points that a student can collect for current educational activity during semester in order to be admitted to the exam is 72 points.

Calculating of the number of points is based on obtained marks of student according to traditional scale while learning subject during the semester, by calculating the arithmetic mean (AM) that is rounded to two signs after comma.

Evaluation of independent work of students. Independent work of students, which is provided by the topic of the lesson together with the classroom work, is evaluated during the current control of the topic in the relevant lesson. Assimilation of topics that are submitted only for independent work is checked during the final module control.

Evaluation of final control.

The maximum number of points that a student can score during the exam is 80 points.

The final control is considered credited if the student scored at least 60% of the maximum amount of points (for a 200-point scale - at least 50 points).

Determining the number of points that a student scored in the discipline: the number of points that a student scored in the discipline is defined as the sum of points for the current academic activity (Table 1) and for the final control (diff.credit, exam) (Table 3).

Table 3. Scale of assessment of differentiated (exam) credit:

Traditional scale	Points
«5»	70-80
«4»	60-69
«3»	50-59

Requirements for written work

The final written work is performed in the form of a test.

Practical classes

Classroom work

The 3rd semester

Module 1. Morphology and physiology of microorganisms. The infection and immunity.

Topics 1-14: Classroom work - score from 2 to 5 for each topic.

Topic 15: Differentiated credit (semester control) Semester control at the end of the 2nd semester is provided in the form of Differentiated credit. (Table 2) Provides a final grade on a 120-point

scale as the sum of grades for the current control of knowledge (oral examination, written survey, Practical work, abstracts), the results of 2 content modules.

Semester control is evaluated from 50 to 80 points and consists of:

Test control - 40 tests = 40 points (1 point for the correct answer to 1 test).

Answer to 2 theoretical questions of 20 points for each = 40 points. Amount: 80.

Scale of assessment:

Traditional scale	Points
«5»	70-80
«4»	60-69
«3»	50-59

Amount: minimum $72 + 50 = 122$, maximum $120 + 80 = 200$

The 4th semester

Module 2. Special, clinical and ecological microbiology. Special Virology.

Topics 1-19: Classroom work - score from 2 to 5 for each topic.

Topic 20: Final module control 2 - score from 2 to 5. Final module control 2 is evaluated from 50 to 80 points and consists of:

Test control - 40 tests = 40 points (1 point for the correct answer to 1 test).

Answer to 2 theoretical questions of 20 points for each = 40 points. Amount: 80.

At the end of the course there is an exam.

The structure of the examination ticket to Microbiology, virology and immunology

1. Theoretical question
2. Theoretical question
3. Theoretical question
4. Practical skills

THE CRITERIA FOR EVALUATION PRACTICAL SKILLS AND THEORETICAL QUESTIONS

Number of practical skills	«5»	«4»	«3»	The answer is a card to the practical skills	For each answer to the practical skill student receives from 10 to 16 points: «5» - 16 points; «4» - 13 points; «3» - 10 points.
1	16	13	10		
Number of theoretical questions	«5»	«4»	«3»	Oral answer the card on theoretical questions	For each answer to the theoretical question student receives from 10 to 16 points: «5» - 16 points; «4» - 13 points; «3» - 10 points.
1	16	13	10		
2	16	13	10		
3	16	13	10		
The sum of points	80	65	50		

Students who have completed all types of work provided by the curriculum and scored the number of points for the current success not less than the minimum (72) are admitted to the exam.

The total grade for the module and the discipline consists of a total grade for the activities in the current classes and the final control of student knowledge. Current activity is estimated from 72 to 120 points. Thus, the minimum number of points per module should be: $72 + 50 = 122$ points.

Maximum number: $120 + 80 = 200$ points.

Rating scale:

National scale	Points scale
«5»	70-80
«4»	60-69
«3»	50-59

LIST OF THEORETICAL QUESTIONS FOR EXAM

1. Definition of microbiology as a science. Branches of microbiology. Subject and tasks of medical microbiology. The main features and trends of modern microbiology.
2. Discovery of microorganisms by A. Levenhuk. Stages of development of microbiology. The contribution of L. Pasteur and R. Koch in microbiology. Formation of the main directions of microbiological science. The role of D. Samoilovich, E. Jenner, II Mechnikov, D. Ivanovsky, P. Ehrlich, SM Vinogradsky, E. Bering, G. Ramon, G. Domagko, O. Fleming, D.K. Zabolotny, J.I. Zilber, VM Zhdanov, MP Chumakov, F. Burnett and other scientists. Development of microbiology in Ukraine.
3. The main differences between prokaryotes and eukaryotes. Forms of bacteria with a defect in the synthesis of the cell wall, protoplasts, spheroplasts. L-forms of bacteria.
4. Morphology and structure of bacteria. The role of separate structures for bacterial activity and in the pathogenesis of infectious diseases. Vegetative forms and spores.
5. Morphology and classification of protozoa.
6. Classification and morphology of fungi.
7. Methods of microscopy. Preparation of bacteriological smears. Dyes and dye solutions, simple and complex methods of dyeing.
8. Principles of organization, equipment and mode of operation of bacteriological, serological and virological laboratories.
9. Bacterioscopic method of research. Stages.
10. Types and mechanisms of the bacterial nutrition. Mechanisms of penetration of nutrients into the bacterial cell. Chemical composition of microorganisms. The value of the main components.
11. Culture media, requirements for them. Classification of culture media used in microbiology.
12. Respiration of microorganisms. Aerobic and anaerobic types of respiration. Enzymes and cell structures involved in the process of respiration. Methods of culturing of anaerobic bacteria.
13. Enzymes of microorganisms, their role in metabolism. Use for bacterial differentiation. Enzymes of pathogenicity.
14. Growth and methods of bacterial reproduction. Mechanism of cell division, phases of reproduction of bacterial culture in stationary conditions.
15. Bacteriological method of research. Principles of bacterial pure cultures selection and their identification.
16. Influence of physical, chemical and biological factors on microorganisms. Sterilization, methods, control of sterilization efficiency. Asepsis. Antisepsis.
17. Disinfection and sterilization of dental instruments.
18. Extrachromosomal factors of bacterial heredity. Plasmids, their main genetic functions. Migrating elements. The role of mutations, recombination and selection in microbial evolution. The main factors of evolution.
19. Genetic research methods: PCR, DNA probe method, molecular hybridization.
20. Chemotherapy and chemotherapeutic drugs. Chemotherapeutic index. The mechanism of antibacterial action of sulfonamides. The role of P. Ehrlich and G. Domagk in the development of the theory of chemotherapy.
21. The phenomenon of microbial antagonism. The role of Ukrainian microbiologists in the development of the doctrine of microbial antagonism. Antibiotics, characteristics, principles of production, units of measurement. Classification by mechanism of action on microorganisms.
22. Drug resistance of microbes, the mechanism of formation of stable forms. Methods for determining the sensitivity of microbes to antibiotics. Minimum inhibitory (MIC) and minimum bactericidal (MBC) concentrations. Practical meaning. Principles of combating drug resistance of microorganisms.

23. Infection. Factors that cause the occurrence of the infectious process. The role of microorganisms in the infectious process. Pathogenicity, virulence, units of measurement, methods of determination. Factors of pathogenicity of microorganisms, their characteristics.
24. Microbial toxins (exo- and endotoxins). Properties and chemical composition, production, measurement of exotoxin strength. Role in the pathogenesis and immunogenesis of infectious diseases.
25. Phases of development of the infectious process. Mechanisms of infection with pathogenic microorganisms. Bacteremia, toxinemia, sepsis. Periods of infectious disease.
26. The role of the macroorganism in the infectious process. Immunological reactivity of the child's body. The influence of the environment and social conditions on the emergence and development of the infectious process in humans. Persistence of bacteria and viruses. The concepts of relapse, reinfection, superinfection.
27. History of discovery and main stages of development of virology. The contribution of Ukrainian scientists. Methods of studying viruses, their evaluation.
28. Morphology and ultrastructure of viruses. Types of symmetry of viruses. Chemical composition, functions of components of viruses.
29. Bacteriophages, history of study. Structure, classification of phages by morphology. Methods of qualitative and quantitative determination of bacteriophages. Practical use of bacteriophages.
30. Forms of interaction of bacteriophages with a bacterial cell. Virulent and moderate phages. Characteristics of productive interaction. Lysogeny and phage conversion.
31. Modern views on the nature and origin of viruses. The place of viruses in the living system.
32. Principles of virus classification. The main properties of human and animal viruses.
33. Methods of culturing viruses and their evaluation.
34. Viral hemagglutination and hemadsorption reactions. Mechanism, practical significance, use, diagnostic value.
35. Serological reactions used in virology. Virus neutralization reaction, mechanism, principles of use, diagnostic value.
36. Hemagglutination inhibition reaction, its mechanism, conditions of production, principles of use, diagnostic value.
37. Complement binding reaction, its essence, evaluation. Features of complement fixation reaction in viral infections.
38. Reactions with labeled antibodies and antigens in virology. Immunofluorescence reaction (RIF), enzyme-linked immunosorbent assay (ELISA).
39. Genetic research methods in virology: PCR, DNA probe method, molecular hybridization
40. The use of cell cultures in virology. Classification of cell cultures. Nutrient media for cell culture.
41. Types of interaction between viruses and cells. Characteristics of productive interaction, stages.
42. Features of the pathogenesis of viral infections. Acute and persistent viral infections.
43. Immunological features of viral infections. Factors of antiviral immunity.
44. Methods of virus detection in cell culture and their evaluation. Cytopathogenic action of viruses, its types.
45. Nonspecific factors of protection of a macroorganism from viral agents, their characteristics. Interferons, mechanism of action, interferonogens.
46. Viral vaccines, classification, principles of obtaining, requirements for them, control, evaluation of effectiveness.
47. The doctrine of immunity. Stages of development of immunology. Types of immunity and forms of its manifestation.
48. Nonspecific factors of protection of an organism against pathogenic microbes. Complement, its properties, ways of activation. Phagocytosis, types of phagocytic cells. Stages of phagocytosis. Complete and incomplete phagocytosis.
49. Nonspecific factors of protection of an oral cavity. *

50. The body's immune system, its organs. The role of the thymus gland in the immune response. Cells of the immune system, their varieties, the interaction of T-, B-lymphocytes and macrophages. Their role in cellular and humoral immunity.
51. Patterns of the body's immune response. Phases of the immune response. Immunological reactions. Immunological tolerance, causes of its occurrence. Immunological memory, its mechanism.
52. Immediate and delayed type hypersensitivity, their mechanisms, differences. Practical meaning.
53. Tricellular system of immune response cooperation. The role of individual cells of the immune system, their interaction. Interleukins.
54. Antigens, their characteristics. Complete and incomplete antigens. Antigenic structure of bacteria. The practical significance of the doctrine of microbial antigens. Autoantigens.
55. Antibodies, their nature. The place of synthesis, dynamics of antibody production. Autoantibodies.
56. Antitoxins, their properties, mechanism of action. Principles of obtaining antitoxic sera. Units of measurement, practical use.
57. Serological reactions, their characteristics, main types, practical use. Agglutination reaction, its mechanism, varieties. Practical use.
58. Serological reactions. Precipitation reaction, its mechanism. Use in medical practice. Gel precipitation reaction.
59. Serological reactions. Lysis reactions. Complement binding reaction, its practical use.
60. Reactions with labeled antibodies or antigens. Practical use of immunofluorescence reaction (RIF), enzyme-linked immunosorbent assay and radioimmunoassay.
61. Forms and types of immune response. Humoral immune response and its stages.
62. Primary and secondary immune response. Interaction of cells of the immune system in the process of immune response.
63. Immune response reactions, their characteristics. Cellular immune response.
64. Immediate and delayed type hypersensitivity. The mechanism of development of these reactions.
65. Monoclonal antibodies, their production and use in medical practice.
66. Immunodeficiency states, autoimmune processes. Complex assessment of the immune status of the organism.
67. Live vaccines, principles of production. Control, practical use of live vaccines, evaluation of effectiveness.
68. Vaccines. Obtainment history. Classification of vaccines. Corpuscular, chemical, synthetic, genetically engineered and anti-idiotypic vaccines.
69. Chemical vaccines and toxoids, principles of production. Associated vaccines. Adsorbed vaccines, the principle of "depot".
70. Anatoxins (toxoids), their production, purification, units of measurement, use, evaluation.
71. Corpuscular vaccines from killed microbes. Principles of obtaining, control, evaluation of efficiency.
72. General characteristics of cocci. Staphylococci, biological properties, classification, practical significance.
73. The role of staphylococci in the development of human pathology, the pathogenesis of the processes caused by them. Characteristics of toxins and pathogenic enzymes. Role in the occurrence of nosocomial infection.
74. Methods of microbiological diagnosis of staphylococcal processes and their evaluation. Immunity in staphylococcal diseases. Drugs for specific prevention and therapy, evaluation.
75. Streptococci, biological properties, classification. Toxins, enzymes of pathogenicity.
76. Streptococci pneumoniae, biological properties. Pathogenicity to humans and animals. Microbiological diagnosis of pneumococcal diseases.

77. Streptococci. Role in human pathology. Pathogenesis of streptococcal diseases. Toxins and enzymes of pathogenicity of streptococci. Immunity. Methods of microbiological diagnosis of streptococcal diseases.
78. Meningococci, biological properties, classification. Pathogenesis and microbiological diagnosis of meningococcal diseases and bacteriocarriers. Differentiation of meningococci from gram-negative nasopharyngeal diplococci.
79. Gonococci. Biological properties, pathogenesis and microbiological diagnosis of diseases. Prevention and specific therapy of gonorrhea and blenorrea.
80. Enterobacteria, their evolution. Significance in the development of human pathology. Microbiological diagnosis of colienteritis. Escherichia, their properties. Pathogenic serovars of Escherichia coli, their differentiation. Microbiological diagnosis of colienteritis.
81. Salmonella - pathogens of typhoid fever and paratyphoid A and B. Biological properties, antigenic structure. Pathogenesis of diseases. Immunity. Specific prevention and therapy.
82. Pathogenetic bases of microbiological diagnostics of typhoid fever and paratyphoid fever A and B. Methods of microbiological diagnostics, their estimation.
83. Salmonella - the causative agents of acute gastroenteritis, their properties. Principles of classification. Pathogenesis of food toxicoinfections of salmonellosis nature. Microbiological diagnostics.
84. Genus Shigella, biological properties, classification. Pathogenesis of dysentery.
85. Shigella. Role in human pathology. Pathogenesis of dysentery, the role of toxins and pathogenic enzymes. Immunity. Methods of microbiological diagnosis of dysentery, their evaluation.
86. Vibrio cholerae, biological properties, biovars. Pathogenesis and immunity in cholera. Methods of microbiological diagnosis of cholera and their evaluation. Specific prevention and treatment of cholera.
87. Yersinia. The causative agent of plague, the history of the study, biological properties. The role of Ukrainian scientists in the study of plague. Pathogenesis, immunity, methods of microbiological diagnosis and specific prevention of plague.
88. The causative agent of tularemia, biological properties. Pathogenesis, immunity, methods of microbiological diagnosis and specific prevention of tularemia.
89. Brucella, species, differentiation. Pathogenesis and immunity in brucellosis. Methods of microbiological diagnosis of brucellosis, their evaluation. Drugs for specific prevention and therapy.
90. Klebsiella, their role in human pathology. Characteristics of Klebsiella pneumonia, ozena, rhinoscleromatis. Microbiological diagnostics, specific prevention.
91. Bordetella, their properties. Pertussis pathogen, morphological, cultural, antigenic properties. Microbiological diagnosis and specific prevention of pertussis.
92. Anthrax bacilli. Biological features, pathogenesis, microbiological diagnosis and specific prevention of anthrax. The role of Ukrainian scientists in obtaining drugs for specific prevention of anthrax.
93. Anaerobic non-clostridial bacteria (bacteroids, peptostreptococci, prevotella, veilonella, etc.), their biological properties. Their importance in the development of general human pathology and pathology of the oral cavity. Features of microbiological diagnosis of diseases caused by anaerobes.
94. Clostridium tetanus, properties. Toxin formation. Pathogenesis of tetanus in humans. Microbiological diagnostics, specific prevention and therapy, their theoretical substantiation and assessment.
95. Clostridia botulinum. Morphological and cultural features, antigenic structure, toxin formation, classification. Pathogenesis, microbiological diagnosis and therapy of botulism.
96. Pathogens of anaerobic wound infection, properties, classification. Pathogenesis and microbiological diagnosis. Methods of specific prevention and treatment of anaerobic wound infection.

97. Corynebacteria, characteristics. Biovars of diphtheria bacilli. Toxin formation, genetic determinants of toxigenicity. Measurement of toxin strength.
98. The causative agent of diphtheria, biological properties. Characteristics of exotoxin. Specific prevention and treatment of diphtheria. Detection of antitoxic immunity. Diphtheria drugs.
99. Pathogenesis of diphtheria, immunity. Microbiological diagnosis of bacteriocarriers. Differentiation of the causative agent of diphtheria and saprophytic corynebacteria.
100. Pathogenic mycobacteria, role in the development of human pathology. Pathogens of tuberculosis, properties. Types of tuberculosis bacteria. Pathogenesis and microbiological diagnosis of tuberculosis.
101. Microbiological diagnosis of tuberculosis. Immunity in tuberculosis. Specific prevention and treatment of tuberculosis.
102. Mycobacteria of tuberculosis, properties. Types of tuberculosis bacteria. Tinctorial and cultural properties. Differentiation of tuberculosis pathogens.
103. The causative agent of leprosy, biological features. Significance in the development of human pathology.
104. Pathogenic fungi and actinomycetes (pathogens of candidiasis, dermatomycosis, actinomycosis, their characteristics). Principles of microbiological diagnosis of mycosis.
105. Pathogenic actinomycetes. Biological properties. Significance in human pathology. Principles of microbiological diagnostics.
106. The causative agent of syphilis. Morphological, cultural properties. Pathogenesis and immunity. Microbiological diagnosis and specific therapy of syphilis.
107. Leptospira, their characteristics, classification. Pathogenesis, immunity and microbiological diagnosis of leptospirosis. Specific prevention and therapy.
108. Borrelia, biological properties. Role in the development of human pathology. Pathogens of epidemic and endemic relapsing fever. Pathogenesis, immunogenesis and microbiological diagnosis of relapsing fever. Specific prevention and treatment of recurrent typhus.
109. The causative agent of Lyme disease. Pathogenesis of the disease, microbiological diagnosis, therapy and prevention.
110. Rickettsiae, biological properties. Classification. Characteristics of human diseases. The causative agent of Q fever. Pathogenesis of the disease, laboratory diagnosis, specific prevention.
111. Pathogens of typhus, properties. Pathogenesis of the disease, evaluation of methods. Specific prevention, evaluation of drugs. Laboratory diagnostics.
112. Mycoplasmas, classification. Biological properties, cultivation methods. Role in the development of human pathology. Microbiological diagnosis of mycoplasmosis.
113. Chlamydia, classification, biological properties. Cultivation methods. Role in the development of human pathology. Microbiological diagnosis of chlamydia.
114. Pathogenic spirilla. The causative agent of rat bite fever. Microbiological diagnosis of the disease.
115. Campylobacter - the causative agent of acute intestinal diseases. Biological properties, microbiological diagnostics.
116. Helicobacter pylori as the causative agent of human gastroduodenal diseases. Discovery, biological properties, pathogenesis. Methods of microbiological diagnostics. Modern methods of treatment of Helicobacter pylori infection.
117. Modern methods of laboratory diagnosis of infectious diseases.
118. Family of Orthomyxoviruses. History of discovery, biological properties, classification.
119. Methods of laboratory diagnosis of influenza and their evaluation.
120. Antigenic structure and types of antigenic variability of influenza virus. Modern hypotheses that explain the antigenic variability of orthomyxoviruses.
121. Pathogenesis and immunity to influenza. The role of specific and nonspecific mechanisms in influenza immunity.
122. The problem of specific prevention and treatment of influenza. Drugs and their evaluation.

123. Paramyxovirus family, general characteristics of the family. Parainfluenza viruses, their biological properties. Role in the development of human pathology. Laboratory diagnosis of parainfluenza infections.
124. Measles virus, biological properties, cultivation. Pathogenesis of infection. Laboratory diagnostics, specific prevention.
125. Mumps virus. Pathogenesis of infection. Laboratory diagnosis, specific prevention of mumps.
126. Paramyxovirus family. General characteristics. Respiratory syncytial virus. Biological properties, role in the development of human pathology. Methods for diagnosing diseases caused by RS viruses.
127. Coronavirus family. General characteristics. Features of SARS and MERS pathogens. Pathogenesis of diseases. Laboratory diagnostics. Prospects for specific prevention.
128. Picornavirus family, general characteristics. Antigenic structure. Biological features of Coxsackie and ECHO viruses. Significance in the development of human pathology.
129. Polioviruses, characteristics, classification. Pathogenesis and immunogenesis of infection. Laboratory diagnostics, specific prevention. Elimination of polio worldwide.
130. Genus of enteroviruses, general characteristics, classification. Laboratory diagnosis of enteroviral infections.
131. Genus of rhinoviruses, biological properties. Classification. Role in human pathology. Methods of laboratory diagnosis of infections caused by rhinoviruses.
132. Rhabdovirus family. Rabies virus, biological properties. Pathogenesis of the disease. Laboratory diagnostics. Specific rabies prevention.
133. General characteristics of the ecological group of arboviruses. Flaviviruses (family Flaviviridae). Tick-borne and Japanese encephalitis viruses. Distribution in nature. The mechanism of transmission of the pathogen to humans. Biological properties, methods of laboratory diagnostics, specific prevention.
134. Ecological group of arboviruses. Bunyaviruses (family Bunyaviridae), togaviruses (family Togaviridae, genus *Alfavirus*). General characteristics. Classification. Principles of laboratory diagnostics.
135. The main representatives of pathogenic human flaviviruses: tick-borne encephalitis, yellow fever, dengue fever, Japanese encephalitis, Omsk hemorrhagic fever. Features of pathogenesis. Natural focus.
136. Filoviruses (family Filoviridae). Ebola and Marburg fever virus. Epidemiology. General characteristics. Pathogenesis of diseases. Laboratory diagnostics.
137. Genus Rubiviruses. Rubella virus. Biological properties. Pathogenesis of the disease, immunity. Laboratory diagnostics, specific prevention.
138. Retroviruses family, biological properties. Classification. The mechanism of viral carcinogenesis.
139. Herpesvirus family, biological properties, importance in the development of human pathology. Laboratory diagnosis of diseases. Genetic diagnostic methods.
140. Adenovirus family. Biological properties. Antigenic structure. Cultivation. Pathogenesis and laboratory diagnosis of adenoviral infections. Immunity. Specific prevention.
141. Smallpox virus. Pathogenesis of infection. Methods of diagnosis and specific prevention. Vaccine virus. Elimination of smallpox worldwide.
142. Families Papillomaviridae and Polyomaviridae. General characteristics and classification. Morphology of viruses. Pathogenesis of diseases caused by these viruses. Oncogenicity. Laboratory diagnostics.
143. Pathogens of viral hepatitis, properties and classification of viruses. Pathogenesis of diseases. Laboratory diagnostics. Prospects for specific prevention.
144. Oncogenic viruses, classification. Viral-genetic theory of tumors by L.O. Zilber. Mechanisms of viral carcinogenesis.

145. Human immunodeficiency viruses (HIV). Properties. Role in human pathology. Pathogenesis of AIDS. Methods of laboratory diagnostics (immunological, genetic). Prospects for specific prevention and therapy.
146. Prions. Properties. Prion diseases of animals (scrapie, spongy encephalopathy of cows) and humans (kuru, Creutzfeldt-Jakob disease, etc.). Pathogenesis of prion diseases. Diagnosis.
147. Conditionally pathogenic microorganisms, biological properties, etiological role in the development of opportunistic infections. Characteristics of diseases caused by opportunistic pathogens.
148. Normal microflora of the oral cavity. Its role in the human body. Changes in the microflora depending on age, health status, tooth loss, etc.
149. Normal microflora of the human body, its role in physiological processes and the emergence of human pathology. Age features of the normal microflora of the nose, skin, mouth, genitals, intestines. Gnotobiology. Dysbacteriosis and its causes.
150. Probiotics, prebiotics - drugs to restore the normal microflora of the human body (bifidumbacterin, lactobacterin, colibacterin, bifikol, biosporin, bactisubtil, multiprobiotics of the group "Sembiter", etc.). Mechanism of action.
151. The role of microorganisms in the etiology and pathogenesis of diseases of the teeth (pulpitis, periodontitis), periodontium, oral mucosa, hard and soft tissues of the dental apparatus (abscesses, phlegmons, cysts, etc.).
152. Nonspecific factors of protection of the oral cavity and immunoglobulins.
153. Plaque microflora, its role in the development of dental caries.
154. Lesions of the oral mucosa in various bacterial and viral infections. Fungal stomatitis.
155. Methods of microbiological diagnosis of infectious pathology of the oral cavity.
156. Nosocomial infection, conditions of its occurrence. Properties of hospital ecovars of microorganisms. Microbiological diagnosis of purulent-inflammatory, burn infections and wound infections caused by hospital strains.
157. Clinical microbiology. Object of research. Subject, tasks, methods. Criteria for the etiological role of opportunistic pathogens isolated from the pathological focus.
158. Sanitary-indicative microorganisms, requirements to them, their value for the characteristic of objects of environment.
159. Water microflora. Survival of pathogenic microorganisms in water. The role of water in the transmission of infectious diseases. Sanitary and bacteriological control over drinking water quality, sanitary and indicative microorganisms.
160. Soil microflora. Sanitary-indicative microorganisms. The role of soil in the transmission of infectious diseases. Factors affecting the survival of pathogenic microorganisms in the soil.
161. Air microflora, its characteristics. Sanitary-indicative microorganisms. The role of air in the transmission of infectious diseases.
162. Sanitary and bacteriological examination of everyday objects and equipment. Sanitary-indicative microorganisms. Types of pollution.
163. Pathogens of food poisoning. Principles of sanitary and bacteriological research of food products.
164. The role of water, soil, air in the transmission of viral infections. Viruses that are most often found in the environment.
165. The role of the air environment in the spread of pathogens of respiratory viral infections. Methods of indication of respiratory viruses.

Circumstance of admission to the final control

1. Semester control at the end of the 1st semester is provided in the form of a differential credit. (Table 2) Provides a final score on a 120-point scale as the sum of scores for the current control of knowledge (oral examination, written

	<p>survey, tests, verification of identification of micropreparations, abstracts), the results of 2 content modules.</p> <p>2. Students are allowed to take the differentiated credit, exam only if there is no debt for the implementation of the curriculum.</p>
7. Course policy	
<p>The organization of the educational process is carried out with the use of the European Credit Transfer System (ECTS) to assess student performance. The points gained in the current survey, independent work and points of the final control are credited. This must take into account the student's presence in class and his activity during practical work. Inadmissible: absences and late classes; use of a mobile phone, tablet or other mobile devices during the lesson (except for the cases provided by the curriculum and methodical recommendations of the teacher); copying and plagiarism; untimely performance of the task, the presence of unsatisfactory grades for 50% or more of the submitted theoretical and practical material.</p>	
8. RECOMMENDED LITERATURE	
<p>Basic:</p> <ol style="list-style-type: none"> 1. Medical microbiology, virology and immunology - T. V. Andrianova, V. V. Bobyr, V. V. Danyleichenko, etc. / Ed. by V. P. Shyrobokov/ - Vinnytsia: Nova Knyha, 2019. - 744 p. 2. Cappuccino G. Microbiology: A Laboratory Manual, Global Edition, 11th Edition / G.Cappuccino, Chad T. Welsh. - Pearson Higher Ed USA, 2017. - 560 p. 3. Medical Microbiology 27 E (Lange) / K. C. Carroll, S. Morse, T. Mietzner [et al.]. - McGraw-Hill Education, 2016. - 864 p. 4. Murray P.R. Medical Microbiology 8th Edition / P.R. Murray, K.S. Rosenthal, M.A. Pfaller. - Elsevier, 2016. - 848 p. 	<p>Additional:</p> <ol style="list-style-type: none"> 1. Murray P.R. Basic Medical Microbiology 1st Edition / P.R. Murray. - Elsevier, 2018. - 240 p. 2. Medical Microbiology, International Edition, 19 Ed / M.R. Barer, W. Irving, A. Swann [et al.]. - Elsevier, 2018. - 760 p. 3. Engelkirk P.G. Burton's Microbiology for the Health Sciences / P.G. Engelkirk, J. Duben-Engelkirk, R. Fader. - Wolters Kluwer Health, 2015. - 488 p. 4. Hawley L. Microbiology and Immunology (Board Review Series) Sixth Edition / L. Hawley, R.J. Ziegler, B. L. Clarke. - Lippincott Williams & Wilkins, 2014. - 320 p.

Lector  Ph.D. A. Pogribna