

**Assessment tools for conducting attestation
in discipline «Microbiology»
for students of 2024 year of admission
under the educational programme
33.05.01 Pharmacy,
specialisation (profile) Pharmacy
(Specialist's degree),
form of study full-time
for the 2025-2026 academic year**

1. Assessment tools for conducting current attestation in discipline «Microbiology»

The current attestation includes the following types of tasks: tests, situational tasks, assessment of the development of practical skills, interview on control questions, preparation of a report.

2. Assessment tools for conducting intermediate attestation in a discipline «Microbiology»

Intermediate attestation is carried out in the form of an exam with a mark.

List of questions to prepare for the intermediate attestation:

1. Medical microbiology: goals and tasks, relation with other medical sciences.
2. Origination and development of microbiology. The role of Russian scientists and microbiologists in the development of world science.
3. Microbiological laboratory. The equipment of a microbiological laboratory. Rules of work in a microbiological laboratory.
4. Methods of microbiological diagnostics: the microscopic method, bacteriological method, biological method, serological method, allergic method (skin test), the molecular genetic method.
5. The microscopic method. Magnification and microscope design. Varieties of an optical microscope. Technique of immersion in oil.
6. Bacterial morphology. Bacterial shape, arrangements and sizes. Classification of bacteria by shapes.
7. Tinctorial properties of microbes. Preparing specimens for optical microscopes. The simple and complete staining methods.
8. Taxonomy: organization, classification and designation of microorganisms.
9. Prokaryotic cell structure. Permanent (obligate) and non-permanent (non-obligate) structures of prokaryotic cells.
10. Permanent (obligate) structures of prokaryotic cells: a cell wall, cytoplasmic membrane, nucleoid, ribosomes, cytoplasm, mesosomes. Chemical composition and functions. Methods of detection.
11. The structure of a cell wall. The chemical composition and functions of a cell wall.
12. The main distinction between Gram-positive cell wall and Gram-negative cell envelope. Features of the morphological organization of protoplasts, spheroplasts and L-forms of bacteria.
13. Gram's method as a method to reveal the structure of a cell wall. Procedure and mechanism of Gram's staining. Practical value of Gram's staining.
14. Non-permanent (non-obligate) structures of prokaryotic cells: capsules, flagella, pili and fimbriae, spores, intracellular inclusions, plasmids. The chemical composition and functions. Methods of detection.

15. The study of motile microorganisms by the wet-mount slide (crushed-drop) and hanging-drop technique.
16. Complete methods of staining the non-permanent (non-obligate) structures of prokaryotic cells.
17. Comparing eukaryotic and prokaryotic cells. Distinctions and main characteristics of the prokaryote and eukaryote.
18. Bacteria of unique morphology and biology: *Actinomycetes*, *Spirochaetes*, *Rickettsia*, *Chlamydia*, *Mycoplasmas*.
19. Characteristic taxonomic position of *Actinomycetes*. Biological characteristics of the *Actinomycetes*. Infections by *Actinomycetes*.
20. Characteristic taxonomic position of *Spirochetes*. Morphology and ultrastructure of *Spirochetes*. Classification of *Spirochaetes*. Differences between structures of *Treponema*, *Borrelia* and *Leptospira*.
21. Characteristic taxonomic position of obligate parasitic bacteria: the *Rickettsia* and *Chlamydia*. Biological characteristics of the *Rickettsia* and *Chlamydia*: morphology, ultrastructure and classification.
22. Biological characteristics of the *Mycoplasmas*. Bacteria that have lost their cell walls – L-forms.
23. The Kingdom of the Fungi. Organization of microscopic fungi. Reproductive strategies and spore formation. Fungal classification. Fungal identification and cultivation.
24. Chemical analysis of cell contents. The metabolism of microbes: catabolism and anabolism.
25. Microbial nutrition. Forms, sources and functions of essential nutrients. Classification of nutritional types.
26. Transport: movement of substances across the cell membrane. Diffusion and molecular motion.
27. Nutrient media: classification, examples and practical application.
28. The bacteriological method (stages, practical significance): inoculation, growth (cultural properties), and identification of cultures.
29. Differentiate between a pure culture, subculture, mixed culture and contaminated culture. Inoculation: growth and identification of cultures. Isolation techniques. Identification techniques.
30. Enzymes: classification, their role and examples. Enzyme specificity and efficiency.
31. Biochemical identification of pure culture, biochemical tests.
32. Catabolism: an overview of nutrient breakdown and energy release. Types of respiration. Aerobic respiration. Anaerobic respiration. The importance of fermentation.
35. Anaerobic growth media and methods of anaerobes cultivation.
36. The growth and reproduction of bacteria.
37. Introduction to genetics and genes. Structure and function of the genetic material. DNA replication: preserving the code and passing it on.
38. Mutation: change in the genetic material. Types of mutations. Causes of mutations. Categories of mutations. Repair of mutations. Positive and negative effects of mutations.
39. Genetic transfer and recombination.
40. Transformation in bacteria: the mechanism and phases; Griffith's original transformation experiment.
41. Conjugation in bacteria: the mechanism, phase; strains F⁺, F⁻, Hfr.
42. Transduction in bacteria: the mechanism of common specific and abortive transduction; its significance.
43. Plasmids and transposons. The groups of plasmids and their function. Transposable elements. Differences between IS-elements, transposons and plasmids.
44. Tools and techniques of DNA technology. The molecular genetic method.
45. Classification of phages. Composition of bacteriophages. Morphology of bacteriophage.
46. Differentiation of bacteriophages on the basis of their life cycle. The replication of a bacteriophage: lytic cycle and lysogenic cycle.

47. Significance of bacteriophages. Practical applications of bacteriophages in therapy and prophylactics of bacterial diseases: history, contemporary state, and perspectives.
48. Ecology of microorganisms. Microbes and ecosystem niches. Microbial role in biogeochemical cycling. Sanitary microbiology: goals and objectives. The concept of sanitary-indicative microorganisms.
49. Microflora of air. Sanitary - indicative bacteria of air. Examination of air microflora: Koch's sedimentation method; Krotov's aspiration method. Microbial diseases transmitted through the air.
50. Microflora of water. Sanitary - indicative bacteria of water. Examination of water microflora: membrane filters method; titration method (Eijkman's method). Microbial diseases transmitted through the water. Saprobity of water.
51. Microflora of soil. Sanitary - indicative bacteria of soil. Examination of soil microflora: membrane filters method; titration method. Microbial diseases transmitted through the soil.
52. Normal microflora of the human body. Resident and facultative microbiota. Importance of normal flora. Change of a quantitative relation and composition of a normal microflora of an organism: dysbiosis, dysbacteriosis. Conditions inducing dysbios. Stages of dysbios.
53. Normal microflora of genitourinary system.
54. Normal microflora of the intestinal tract, its formation and significance.
55. Normal microflora of the respiratory tract. Obligate and facultative flora of each area.
56. Normal microflora of skin, eye and ear. Obligate and facultative flora of each area.
57. Microflora of plants. Phytopathogenic microorganisms. Microflora of medical plants, medicinal raw materials and medicinal products.
58. Sterilization. Physical methods.
59. Disinfection. Chemical methods of microbial control. Principles of effective disinfection. Types of disinfectants.
60. What do «infection», «infectious process», «infectious disease» signify? Factors, contributing to the development of an infectious process.
61. Pathogenicity and virulence of bacteria. Factors of virulence of bacteria.
62. Dynamics (stages) of development of infectious diseases.
63. Classifications of infectious diseases.
64. Animal model. The methods of animal inoculation, their autopsy and bacteriological investigation.
65. Concept of chemotherapeutic drugs. Antibiotics. Characteristics of an ideal antimicrobial drug.
66. Classification of antibiotics according to their origin, spectrum of action, mechanism of action, chemical structure.
67. Main principles of a rational chemotherapy.
68. Side effects of antibiotics, complications of chemotherapy.
69. Resistance of microbes to antibiotics.
70. Methods of preventing the spread of antibiotic-resistant microorganisms.
71. Methods for detecting bacterial sensitivity to antibiotics.
72. Immunity. Types of immunity. Nonspecific resistance (innate immunity). Acquired immunity.
73. Mechanisms of nonspecific resistance to antimicrobial agents.
74. Phagocytosis. Types of phagocytic cells. Stages of phagocytosis. Completed and incompleting phagocytosis.
75. Complement, pathways of its activation. The role of complement.
76. Main properties of the substance that is considered to be an «antigen». Complete antigens and haptens. Bacterial and virus antigens.
77. Acquired immunity: humoral and cell-mediated immunity. Classification of immunoglobulins.

78. Ingredients and mechanism of agglutination reaction. Slide agglutination, tube agglutination, indirect or passive agglutination tests. Practical significance.
79. Ingredients and mechanism of precipitation reaction. Types of precipitation tests. Practical significance.
80. Complement fixation test. Ingredients. Mechanism, practical significance.
81. Vaccines. Classification of vaccines. Examples of each type of vaccines.
82. Live (attenuated) vaccines. Examples. Advantages and disadvantages of live vaccines. Practical significance.
83. Killed (inactivated) vaccines. Examples. Advantages and Disadvantages of killed vaccines. Practical significance.
84. Toxoids (anatoxins), their receipt. Practical significance.
85. Immune serum, their receipt. Practical significance.
86. Classification of pathogenic cocci. General characteristics of pathogenic cocci.
87. Biological properties of staphylococci.
88. Microbiological diagnostics of staphylococcal infections. Specific prevention and treatment of staphylococcal infections.
89. Modern classification of streptococci and its principles. Biological properties of streptococci.
90. Microbiological diagnostics of streptococcal infections. Treatment and prevention of streptococcal infections.
91. Biological properties of pneumococci.
92. Microbiological diagnostics of pneumococcal infections. Specific prevention and treatment of pneumococcal infections.
93. Biological properties of meningococci. Diseases caused by meningococci.
94. Microbiological diagnostics of meningococcal infections. Specific prevention and treatment of meningococcal infections.
95. Biological properties of gonococci. Diseases caused by gonococci.
96. Techniques for the laboratory diagnostics of gonococcal infections. Treatment and prevention.
97. The concept of an anaerobic wound infection. Classification of pathogens. Biological properties of clostridia, pathogens of gas gangrene.
98. Microbiological diagnostics, specific therapy and prevention of gas gangrene.
99. Biological properties of tetanus pathogen. Epidemiology, pathogenesis and clinical manifestation of tetanus in humans.
100. Microbiological diagnostics of tetanus. Specific prevention and treatment of tetanus.
101. Biological properties of botulism pathogens. Epidemiology, pathogenesis and clinical picture of botulism.
102. Diagnostics of botulism. Prevention and treatment of botulism.
103. Biological properties of the pathogen of diphtheria. Characteristics of pathogenicity factors.
104. Microbiological diagnostics, specific therapy and prevention of diphtheria.
105. Biological properties of pertussis and parapertussis. Distinctive features of pertussis and parapertussis.
106. Microbiological diagnostics of pertussis and parapertussis. Specific prevention and treatment.
107. Biological properties of the tuberculosis pathogens. Epidemiology and pathogenesis of tuberculosis infection.
108. Laboratory diagnostics of tuberculosis. Specific prevention and treatment of tuberculosis.
109. Biological properties of the leprosy pathogen. Epidemiology and pathogenesis of leprosy.
110. Microbiological diagnostics of leprosy. Prevention and treatment of leprosy.
111. Biological properties of actinomyces, their medical significance. Microbiological diagnostics of actinomycosis.
112. Biological properties of plague bacteria.
113. Epidemiology, pathogenesis, clinical forms of plague. Laboratory diagnostics of plague. Prevention and treatment of plague.

114. Biological properties of *Brucella*.
115. Epidemiology, pathogenesis, clinical manifestations of brucellosis. Laboratory diagnosis of brucellosis. Specific prevention and treatment of brucellosis.
116. Biological properties of a pathogen of tularemia. Epidemiology, pathogenesis and clinical manifestations of tularemia.
117. Microbiological diagnostics of tularemia. Prevention and treatment of tularemia.
118. Biological properties of anthrax bacilli. Epidemiology, pathogenesis and clinical manifestations of anthrax.
119. Microbiological diagnostics of anthrax. Treatment and prevention of anthrax.
120. General characteristics of the family Enterobacteriaceae. Biological properties of pathogens of acute intestinal infections.
121. Biological properties of pathogens of typhoid and paratyphoid fever. Pathogenesis of typhoid and paratyphoid fever.
122. Microbiological diagnostics of typhoid and paratyphoid diseases depending on the stage of the disease. Isolation of hemo- and stool culture.
123. Serodiagnosis of typhoid and paratyphoid diseases. Diagnostics of bacteria carrying. Treatment and prevention of typhoid and paratyphoid diseases.
124. Biological properties of *Escherichia*. Classification of diarrheagenic coliforms and their characteristics.
125. Laboratory diagnostics of Escherichiosis. Prevention and treatment of infections associated with diarrheagenic coliforms.
126. Biological properties of the pathogens of bacterial dysentery. Classification of *Shigella*.
127. Epidemiology, pathogenesis and clinical manifestation of dysentery. Microbiological diagnostics of dysentery. Specific prevention and treatment.
128. Salmonella, causative agents of food poisoning, biological properties. Classification of Salmonella. Epidemiology, pathogenesis, clinical manifestation of salmonellosis.
129. Diagnosis of salmonellosis. Prevention and treatment of salmonellosis.
130. General characteristics of microorganisms of the genus *Vibrio*. Biological properties of cholera pathogens. Epidemiology, pathogenesis and clinical manifestation of cholera.
131. Microbiological diagnosis of cholera. Prevention and treatment of cholera.
132. General characteristics of pathogenic spirochetes. Classification of spirochetes, their role in the nature and human pathology.
133. Biological properties of *Borrelia*,
134. Epidemiology, pathogenesis, clinical manifestation and immunity of relapsing fever. Laboratory diagnostics of relapsing fever. Characteristics of the principal techniques of diagnostics (microscopic, serological and biological). Prevention and treatment of relapsing fever.
135. Morphology and physiology of *Treponema pallidum*. Epidemiology, pathogenesis and clinical manifestations of syphilis. Laboratory diagnostics of syphilis. Prevention and treatment of syphilis.
136. Biological properties of *Leptospira*. Epidemiology, pathogenesis, clinical manifestation of leptospirosis. Microbiological diagnostics of leptospirosis. Prevention and treatment of leptospirosis.
137. Biological properties of chlamydia. Diseases caused by *C.trachomatis*, *C.psittaci*, *C.pneumonia*. Microbiological diagnostics of diseases caused by chlamydia. Treatment and prevention of chlamydial infections.
138. General characteristics of mycoplasmas. Biological properties of mycoplasmas. Diseases caused by *Mycoplasma*, genus *Mycoplasma* and *Ureaplasma*. Laboratory diagnostics of diseases caused by pathogenic mycoplasmas. Treatment and prevention of mycoplasmic infections.
139. General characteristics of the pathogenic *Rickettsia*. Biological properties of *Rickettsia*. Diseases caused by *Rickettsia*. Microbiological diagnostics of infections caused by *Rickettsia*. Prevention and treatment.
140. Hospital infections. Characteristics of the causative agents. Laboratory diagnostics.

141. Fungi. Biological properties. Epidemiology, pathogenesis and clinical syndromes. Laboratory diagnostics. Treatment, prophylaxis.
142. General characteristics of viruses, their distinction from bacteria. Classification of viruses.
143. Chemical composition of viruses. Structural components of the virion: genome, capsid, capsomers, nucleocapsid, supercapsid (envelope). Reproduction of viruses. Stages in the interaction of viruses with a host cell.
144. Methods of virus cultivation: in the body of susceptible animals; in a chicken embryo; in a cell culture (a tissue culture). Characteristics of a tissue culture. Methods of detection (indication) of a virus in a cell culture: cytopathic effect (CPE); intracellular inclusions; hemadsorption; hemagglutination; plaque method; color probe (metabolism inhibition).
145. Methods of laboratory diagnosis of viral infections (viroscopic (microscopic), virologic, serologic), their specific features. Detection and identification of viruses.
146. Viruses that cause acute respiratory viral infections (ARI). General characteristics of ARI.
147. *Orthomyxoviridae* family. Biological properties of influenza viruses types A, B, C. Epidemiology and pathogenesis. Laboratory diagnostics of influenza. Treatment and prevention.
148. *Paramyxoviridae* family. Biological features of parainfluenza virus. Epidemiology, pathogenesis and laboratory diagnosis of parainfluenza. Principles of treatment and prevention.
149. *Adenoviridae* family. Biological properties of adenoviruses. Epidemiology and pathogenesis of adenovirus infection. Laboratory diagnostics and prevention of adenovirus infection.
150. Biological properties of Respiratory syncytial virus. Epidemiology, pathogenesis and laboratory diagnostics of infection. Principles of treatment and prevention.
151. Measles virus, biological properties, specific features of the disease, diagnostics and prevention.
152. Epidemic mumps virus, biological properties, specific features of the disease, diagnostics and prevention.
153. Biological properties of rubella virus, specific features of the disease, diagnostics, prevention.
154. Family of *Herpesviridae*: classification, biological properties, specific features of the diseases. Principles of laboratory diagnostics of herpetic infections and their prevention.
155. *Herpes simplex* viruses type I and II. Epidemiology and clinical manifestation of herpes infections. Laboratory diagnostics of herpetic infections and their prevention.
156. *Varicella zoster* virus and herpes zoster. Epidemiology, pathogenesis and clinical manifestation of the diseases. Laboratory diagnostics, treatment and prevention.
157. *Epstein-Barr* virus. Epidemiology, pathogenesis and clinical manifestation of the diseases. Laboratory diagnostics, treatment and prevention.
158. *Cytomegalovirus*. Epidemiology, pathogenesis and clinical manifestation of the diseases. Laboratory diagnostics, treatment and prevention.
159. General characteristics of enteroviral diseases and their agents. *Picornaviridae* family. Viruses of *Coxsackie* and *ECHO*. Epidemiology and pathogenesis of the diseases. Laboratory diagnostics of enteroviral infections.
160. Biological properties of a poliomyelitis virus. Epidemiology and pathogenesis of the disease. Prevention of poliomyelitis.
161. Rabies virus, biological properties. Features of the disease, diagnostics, prevention.
162. DNA-oncogenic viruses and their characteristics.
163. RNA-oncogenic viruses and their characteristics.
164. Viruses, pathogens of hepatitis types A and E, biological properties. Epidemiology, specific features of pathogenesis, diagnostics, prevention.
165. Hepatitis B virus. Biological properties. Epidemiology, pathogenesis and clinical manifestation. Laboratory diagnostics, treatment and prevention.
166. Hepatitis C virus. Biological properties. Epidemiology, pathogenesis and clinical manifestation. Laboratory diagnostics, treatment and prevention.

167. Hepatitis D virus. Biological properties. Epidemiology, pathogenesis and clinical manifestation. Laboratory diagnostics, treatment and prevention.
168. Causative agents of slow viral infections. Biological properties. Epidemiology, pathogenesis and clinical syndromes. Laboratory diagnostics. treatment and prevention.
169. Causative agent of smallpox. Biological properties. Epidemiology, pathogenesis and clinical syndromes. Laboratory diagnostics, treatment and prevention.
170. HIV infection: biological properties of pathogens. Specific features of the disease (AIDS), diagnostics, prevention.

The intermediate attestation includes the following types of tasks: an interview and solving a situational task.

The full fund of assessment tools for the discipline is available in the VolgSMU Electronic Information and Educational System at the link(s):

<https://elearning.volgmed.ru/course/index.php?categoryid=401>

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Head of the Department



Professor Stepanenko I.S.