1. What is sterilisation?

   Killing of all kind of germs.

2. What is disinfection?

   Reducing the number of the germs to a safe level, so that they can not cause infection.

3. Parameters of hot-air sterilisation:

   180°C 1 hour, 160°C 2 hours, 140°C 3 hours.

4. Parameters of autoclave:

   121°C, + 1 atm overpressure, 20-30 minutes; or 134°C, +2 atm overpressure, 10 minutes.

5. What is the biological method used to check the effectivity of sterilisation?

   Using *Bacillus/Geobacillus stearothermophilus* spores. If the spores could be cultured successfully after the procedure, it was insufficient.

6. What test is used to check for pyrogenic endotoxin?

   LAL test; The blood of horseshoe crab (*Lymulus polyphemus*) will coagulate in the presence of the LPS.

7. What are the disinfectants?

   Chemical agents used on non-living surfaces.

8. What are the antiseptics?

   Chemical agents used on living surfaces (i.e., skin and mucosa).

9. What is a serological reaction?

   In vitro diagnostic test based on specific antigen-antibody binding.

10. What is agglutination?

    Serological reaction where the antigen is cellular/structural (O, K, H).

11. What are the bacterial cell surface (structural) antigens?

    O: cell-wall polysaccharide (Gram-negative), H: pili, K: capsule

12. What is antibody titre?

    The highest dilution (or the lowest concentration) of antibody, where a visible antigen-antibody reaction can be seen in vitro.

13. What is precipitation?

    Serological reaction where the antigen is soluble (enzyme or toxin).

14. What is a iatrogenic infection?

    Infection that occurs during a medical procedure.

15. What is a nosocomial infection?

    Infection that occurs in the hospital 48 hours after admission.

16. What can be the content of vaccines?

    Live attenuated microbe; inactivated microbe; toxoid; surface antigens.

17. Against which diseases is the DaPT vaccine used?

    Diphtheria, pertussis, tetanus

18. What is a native microscopic examination?

The microbes are examined alive.

19. What information can be obtained by light microscopic examination? (3 examples)

    The size, shape, motility and staining of the microbe can be examined.

20. What solutions are used in Gram-staining?

    Sodium oxalate, crystal violet, iodine solution, 96% ethanol, fuchsin or safranin.

21. What devices can be used for anaerobic cultivation?

    Anaerostate, Gas-pack jar, anaerobic chamber

22. Definitions: bacteriostatic, bactericid
    a. bacteriostatic: inhibits the growth of bacteria
    b. bactericid: kills bacteria

23. Definition: selective toxicity

    The antibiotic has an effect only on the bacteria, but not on the human host

24. What is the chemotherapeutic index?

    dosis tolerata maxima (DTM) / dosis curativa minima (DCM)

25. Antibiotics inhibiting cell wall synthesis:

    Penicillins, cephalosporins, carbapenems, glycopeptides

26. Glycopeptide antibiotics:

    vancomycin, teicoplanin

27. Antibiotics altering membrane function:

    Polymyxins (e.g. colistin)

28. Antibiotics inhibiting protein synthesis (3 examples):

    Aminoglycosides, tetracyclines, macrolides, chloramphenicol, lincosamines, linesolide, streptogramins

29. Antibiotics inhibiting nucleic acid synthesis (2 examples):

    Quinolones, rifampicin, sulfonamides, trimethroprim

30. Three possible ways of horizontal gene transfer:
    a. conjugation (plasmids)
    b. transduction (bacteriophage)
    c. transformation (taking up naked DNA from the environment)

31. Major antibiotic resistance mechanisms:
    a. enzymatic inactivation of antibiotic (cleavage or chemical)
    b. efflux pump
    c. modification of the antibiotic binding site

32. What is MRSA?

    Methicillin-resistant *Staphylococcus aureus*

33. What is ESBL?

    Extended spectrum beta-lactamase

34. What is MIC?

Minimum inhibitory (bacteriostatic) concentration of an antibiotic in mg/L.

35. What is MBC?

    Minimum killing concentration of an antibiotic in mg/L.

36. Which three vaccines contain capsular polysacharide?
    a. Hib (*Haemophilus influenzae* type b)
    b. Prevenar / Pneumovax (*Streptococcus pneumoniae* 13 / 23 serotypes)
    c. meningococcus vaccines (ACWY serogroups) – B not!

37. What specimen should be sent to the microbiological laboratory in case of typical pneumonia?

    Sputum and blood (hemoculture)

38. What specimen should be sent to the microbiological laboratory in case of atypical pneumonia?

    blood, urine, bronchoalveolar lavage.

39. Which bacterial infections must be treated with antitoxin? (2 examples)

    Toxin mediated diseases: tetanus, botulism, diphtheria

40. What is coagulase test is used for?

    To distinguish *Staphylococcus aureus* (+) and the other staphylococcus species (-, so-called „coagulase-negative staphylococci")

41. Microscopic morphology of Staphylococci:

    Gram-positive cocci, arranged in grape-like structures

42. Colony morphology of *Staphylococcus aureus* on blood agar:

    Deep yellow (golden), average size, round colonies; beta-hemolysis

43. What virulence factors can *Staphylococcus aureus* possess? (3 examples)

    Protein A, endocoagulase (clumping factor), exocoagulase, adhesion proteins, teicholic acid, lipoteicholic acid, hialuronidase, protease, lipase, DNAse, phosphatase.

44. What toxic virulence factors can *Staphylococcus aureus* produce? (3 examples)

    Hemolysins, leukocidin, exfoliative toxin, toxic shock syndrome toxin, enterotoxins.

45. What kind of non-toxic diseases can be caused by *Staphylococcus aureus*? (3 examples)

    Folliculitis, furuncle, carbuncle, impetigo, wound infections, pneumonia, osteomyelitis, sepsis

46. What kind of toxic diseases can be caused by *Staphylococcus aureus*? (2 examples)

    food poisoning, scalded skin syndrome, toxic shock syndrome

47. What percentage of the adult population is *Staphylococcus aureus* carrier?

    20-30%

48. Please list at least 2 coagulase-negative staphylococcus species (a few examples are below)!

    Staphylococcus epidermidis, *Staphylococcus saprophyticus*, *Staphylococcus haemolyticus*, *Staphylococcus lugdunensis*

49. What can coagulase-negative staphylococci cause?
    a. Nosocomial infections: biofilm production ont he surface of implantates
    b. Endocarditis

50. Colony morphology of *Streptococcus pyogenes* on blood agar:

Small, pin-point colonies, surrounded by large and strong beta-hemolytic zone

51. Which streptococci are alpha-hemolytic? (2 examples)

Streptococcus pneumoniae and viridans streptococci (e.g. *Streptococcus mutans*, *Streptococcus mitis*, *Streptococcus salivarius*)

52. Which is the Lancefield group A streptococcus („GAS")?

Streptococcus pyogenes

53. Which is the Lancefield group B streptococcus („GBS")?

Streptococcus agalactiae

54. What is the causative agent of scarlet fever?

Streptococcus pyogenes

55. Which virulence factor is responsible for scarlet fever?

Streptococcus pyrogenic exotoxin or erythrogenic toxin

56. What kind of non-toxic diseases can be caused by *Streptococcus pyogenes*? (3 examples)

Pharyngitis, tonsillitis follicularis, sinusitis, otitis media, impetigo, erysipelas, necrotising fasciitis

57. What are the two most important post-streptococcal diseases?

Rheumatic fever and post-streptococcal glomerulonephritis

58. Which two streptococcus species are still 100% penicillin susceptible?

Streptococcus pyogenes and *Streptococcus agalactiae*

59. What can *Streptococcus agalactiae* cause in neonates?

Sepsis, meningitis, pneumonia

60. What is the leading causative agent of neonatal meningitis?

Streptococcus agalactiae

61. Microscopic morphology of *Streptococcus pneumoniae*:

Gram-positive capsulated diplococci

62. What are the vaccines against *Streptococcus pneumoniae*?

a. Prevenar-13: *Streptococcus pneumoniae* 13 serotypes, purified capsular polysaccharide conjugated to a carrier protein (can be given to small children as well) – obligatory vaccine in Hungary

b. Pneumovax: *Streptococcus pneumoniae* 23 serotypes, purified capsular polysaccharide (for adults or older children)

63. What can viridans streptococci cause?

Caries, endocarditis

64. Microscopic morphology of *Neisseria gonorrhoeae*:

Gram-negative, not capsulated, bean shaped diplococci. They are mostly seen intracellularly inside WBCs.

65. Which culture medium can be used for *Neisseria gonorrhoeae*?

Chocolate agar; a selective version of it is Thayer Martin agar.

66. Microscopic morphology of *Neisseria meningitidis*:

Gram-negative, capsulated, bean shaped diplococci.

67. How is *Neisseria meningitidis* spreading?

    By respiratory droplets; first it colonises the nasopharynx.

68. What can *Neisseria meningitidis* cause?

    Sepsis, meningitis, Waterhouse-Friderichsen syndrome

69. What is the causative agent of Waterhouse-Friderichsen syndrome?

    Neisseria meningitidis

70. How can *Neisseria meningitidis* get from the nasopharynx to the brain?

    Via blood circulation, as bacteremia develops.

71. Which antibiotics are used as chemoprofilaxis for the contacts of a *Neisseria meningitidis* infected person?

    Rifampicin or ciprofloxacin.

72. What can *Nesseria gonorrhoeae* cause in neonates?

    Ophthalmoblenorrhoea neonatorum

73. Which serotypes of *Haemophilus influenzae* can cause invasive infections?

    The serotype „b" strains.

74. What is the prevention of invasive *Haemophilus influenzae* infections?

    Hib vaccine

75. What can *Haemophillus ducreyi* cause?

    Ulcus molle (or soft chancre).

76. What is the causative agent of pertussis?

    Bordetella pertussis

77. What is the causative agent of tularemia?

    Francisella tularensis

78. Which bacteria can cause human brucellosis? (2 examples)

    Brucella abortus, B. melitensis, B. suis, B. canis

79. What can *Bacillus anthracis* cause? (2 examples)

    Skin anthrax, lung anthrax, intestinal anthrax.

80. What can *Bacillus cereus* cause?

    Food poisoning (vomiting, diarrhoea), skin infections.

81. What is the causative agent of pseudomembranosus colitis?

    Clostridium difficile

82. What is the major symptom of the disease caused by *Clostridium botulinum*?

    Flaccid paralysis

83. What is the major symptom of the disease caused by *Clostridium tetani*?

    Spastic paralysis

84. What is the treatment of botulism?

    Polyvalent antitoxin.

85. What is the treatment of pseudomembranous colitis?

    Oral vancomycin, metronidazol, stool transplantation

86. What is the causative agent of diphtheria?

    Corynebacterium diphtheriae

87. How is the toxin of *Corynebacterium diphtheriae* detected?

    Elek-test (with antitoxin), Römer-test (guinea pig), PCR.

88. What is the treatment of diphtheria?

    Antitoxin, antibiotics, if necessary artificial respiration.

89. What can *Listeria monocytogenes* cause in neonates?

    Granulomatosis infantiseptica, meningitis, sepsis

90. What can *Listeria monocytogenes* cause in adults?

    Mainly gastrointestinal symptoms, meningitis, sepsis, endocarditis

91. What is the treatment of listeriosis?

    Ampicillin-gentamicin combination

92. Which bacteria play crucial role in the formation of caries?

    Streptococcus mutans and Lactobacilli

93. What are the causative agents of human tuberculosis (3 species)?

    Mycobacterium tuberculosis, Mycobacterium bovis, Mycobacterium africanum.

94. What is the special staining for Mycobacteria?

    Ziehl-Neelsen staining.

95. What is the cultivation time of mycobacteria on Löwenstein-Jensen medium?

    6-8 weeks.

96. How can human tuberculosis be prevented?

    BCG vaccination (live, attenuated *Mycobacterium bovis*)

97. Which are the facultative pathogenic mycobacteria (2 examples)?

    Mycobacterium avium-intracellulare komplex, Mycobacterium kansasii, Mycobacterium marinum, Mycobacterium ulcerans.

98. What is the causative agent of leprosy?

    Mycobacterium leprae.

99. What are the clinical menifestations of leprosy?

    Tuberculoid and lepromatous leprosy.

100. Which drugs can be used in the treatment of leprosy (2 examples)?

    Dapson, clofazamin, rifampicin.

101. What are the enteral virulent *Escherichia coli*s? (3 examples)

    ETEC, EPEC, EAEC, EIEC, EHEC

102. What extraintestinal infections can be caused by *Escherichia coli*?

    Urinary tract infections, wound infections, sepsis, neonatal meningitis

103. What is the causative agent of abdominal typhus?

Salmonella Typhi and S. Paratyphi A, B, C

104. What is the causative agent of salmonellosis? (2 examples)

Salmonella Enteritidis, S. Typhimurium, S. Choleraesuis

105. What is the causative agent of dysentery? (2 examples)

Shigella dysenteriae, S. flexneri, S. sonnei, S. boydii.

106. What is the causative agent of plague?

Yersinia pestis.

107. How is plague transmitted?

By the bite of a rat flee; later respiratory droplets.

108. What are the diseases caused by *Klebsiella pneumoniae*?

Friedländer pneumonia, wound infection, blood stream infection, urinary tract infection.

109. What is the causative agent of cholera?

Vibrio cholerae

110. What are the biochemical features of *Pseudomonas aeruginosa*?

Obligate aerobic, oxidase positive.

111. What is the colony morphology of *Pseudomonas aeruginosa*?

Produces water-soluble green pigments, lime-tree smell.

112. What is the microscopic morphology of *Pseudomonas aeruginosa*?

Gram-negative rod.

113. What are the major infections caused by *Pseudomonas aeruginosa*?

Nosocomial infections (lung-, wound-, blood stream infections).

114. Which antibiotics can be used in the treatment of *Pseudomonas aeruginosa*?

As it is multi-resistant, antibiogram must be prepared.

115. How can *Legionella pneumophila* be transmitted?

Inhalation of aerosol.

116. What diagnostic test are used for legionellosis?

Antibody detection from blood, antigen detection from urine (ELISA), immunchromatography; if necessary also cultivation

117. Which bacterium can cause chronic gastritis or gastric ulcer?

Helicobacter pylori

118. What is the major culturable anaerobic bacterium species present in the human intestinal flora?

Bacteroides fragilis

119. Which genuses belong to the spirochetes?

Treponema, Borrelia, Leptospira

120. What is the causative agent of Plaut-Vincent angina?

Treponema vincentii and Fusobacterium.

121. What is the causative agent of syphilis?

Treponema pallidum subspecies pallidum

122. How can syphilis be transmitted?

Sexually, transplacentally.

123. What are the symptoms of first stage syphilis?

Ulcus durum (=painless hard chancre), bubo indolens (=painless enlarged lymph nodes)

124. In which stage of syphilis does the characteristic rush appear all over the body?

2. stage

125. What are the diseases caused by Borrelia?

Lyme disease and relapsing (recurrent) fever

126. How can Lyme disease be transmitted?

By tick bite

127. What is the causative agent of Lyme disease?

Borrelia burgdorferi

128. What is the causative agent of epidemic recurrent fever?

Borrelia recurrentis

129. What is the transmitting vector of *Borrelia recurrentis*?

Body louse

130. What is the molecular background of the relapsing fever in *Borrelia recurrentis* infection?

Antigen change of the bacterium.

131. What is the first symptom of Lyme disease?

Erythema chronicum migrans

132. What are the characteristic features of the meningitis caused by Leptospira?

Serous, non-purulent from with a biphasic progression.

133. How can the Leptospira infections be transmitted?

Zoonosis: urine of animals (mainly rodents) enter through the skin

134. What is the microbial diagnostics of Lyme disease?

Serology (ELISA for screening, Immunoblot for confirmation).

135. Which bacteria do not have cell wall?

Mycoplasma spp., Ureaplasma spp.

136. Which bacteria can cause atypical pneumonia?

Mycoplasma pneumoniae, Chlamydia pneumoniae, Legionella pneumophila.

137. What is the causative agent of exanthemic typhus?

Rickettsia prowaczekii

138. What is the causative agent of psittacosis (parrot fever)?

Chlamydophila psittaci.

139. What is the causative agent of trachoma?

Chlamydia trachomatis serotypes A-C.

140. What is the disease caused by *Chlamydia trachomatis* serotypes L1-L3?

Lymphogranuloma venereum.

141. What is the mode of action of the cholera toxin?

Increasing cAMP, hence enhancing ion secretion.

142. What is the causative agent of impetigo?

S. aureus, S. pyogenes

143. What is the causative agent of erysipelas?

Streptococcus pyogenes

144. What is the causative agent of ophtalmoblenorrhoea neonatorum?

Neisseria gonorrhoeae

145. List at least 4 capsulated bacteria among those listed below!

Streptococcus pneumoniae, Streptococcus agalactiae, Streptococcus pyogenes, Escherichia coli, Haemophilus influenzae, Neisseria meningitidis, Listeria monocytogenes

146. Which two bacteria have a capsule different from the conventional?

Streptococcus pyogenes (hyaluronic acid), *Bacillus anthracis* (poly-glutamic acid)

Mycology

147. Morphological forms of funghi:

Yeasts, molds, dimorphic funghi

148. What is characteristic for the dimorphic funghi?

They show mold morphology at room temperature, but yeast morphology at body temperature

149. How can we classify fungal infections?

Superficial, cutaneous, subcutaneous, systemic and opportunistic mycosis

150. What is the most prevalent fungus causing superficial mycosis?

Malassezia furfur

151. What is the most prevalent fungus causing subcutaneous mycosis?

Sporotrich schenkii

152. List funghi causing systemic mycosis (2 examples)!

Coccidioides immitis, Histoplasma capsulatum, Blastomyces dermatitidis, Paracoccidoides brasiliensis

153. List funghi causing opportunistic mycosis (2 examples)!

Candida sp, Cryptococcus neoformans, Pneumocystis jirovecii, Aspergillus sp., Mucor sp.

154. What are the mode of actions of the antifungal agents?

Inhibition of ergosterol synthesis (azoles), pore formation on ergosterol containing membrane (ployenes), inhibition of nucleic acid synthesis (flucytosin), inhibition of cell wall synthesis (echinocandins)

155. List at least two antifungal agents!

Azoles (itrakonazol, posakonazol, ketokonazol, etc.), Amphotericin B, Caspofungin, Terbinafin

Parasitology - protozoa

156. What two forms can protozoa show during their life cycle?
    Trophozoite (vegetative) and cyst (dormant) forms
157. What are the 4 morphological types of protozoa?
    amoeba, ciliated (Ciliata), flagellated (Flagellata), spore (Sporozoa)
158. What is the causative agent of amoebic dysentery?
    Entamoeba hystolytica
159. Which protozoon can cause steatorrhoea?
    Giardia lamblia
160. What is the treatment of giardiasis?
    Metronidazol
161. Which protozoon can be transmitted sexually?
    Trichomonas vaginalis
162. What is the causative agent of African sleeping sickness?
    Trypanosoma brucei (gambiense and rhodesiense)
163. How can sleeping sickness be transmitted?
    By the bite of tse-tse fly
164. How can malaria be transmitted?
    By the bite of Anopheles mosquito
165. What is the final host of *Toxoplasma gondii*?
    Cat
166. When is toxoplasma infection most dangerous?
    In pregnancy and immunosuppression
167. Which drugs can be used in malaria chemoprophylaxis?
    chloroquin, mefloquin, doxycyclin
168. What is the treatment of malaria?
    chloroquin, mefloquin, artemisin; primaquin against hypnozoites

Parasitology – helminths

169. Morphological types of helminths:
    Flatworms: flukes (Trematoda) and tapeworms (Cestoda); roundworms (Nematoda)
170. What is the common intermediate host of flukes?
    Water snail
171. What is the liver fluke?
    Fasciola hepatica

172. Which fluke lives in the bladder veins?

    Schistosoma haematobium

173. What is the intermediate host of *Taenia saginata*?

    Cow

174. What is the intermediate host of *Taenia solium*?

    Pig

175. Which drugs can be used in the treatment of *Taenia* infections?

    Niclosamide, mebendazol

176. What can *Echinococcus* cause in humans?

    Hydatid cysts

177. What are the final hosts of *Echinococcus*?

    Canines (dog, fox, wolf, stb.)

178. What is the easiest diagnostic way of Enterobius infection?

    Collection of eggs with scotch tape stuck on the perianal region.

179. Which drug can be used in the treatment of Enterobius infection?

    Mebendazol

180. Which worm can cause rectal prolapse?

    Trichuris trichiura

181. What is the largest intestinal Nematode and how big is it?

    Ascaris lumbricoides; 30-40 cm

182. What are the two hookworms?

    Ancylostoma duodenale, Necator americanus

183. How can the hookworms be transmitted?

    Penetration of larva through the skin

184. The larve of which helminths migrate through the lungs? (2 examples)

    Ascaris lumbricoides, Ancylostoma duodenale, Necator americanus

185. What human infections can be caused by *Toxocara canis* and *Toxocara cati*?

    Larva migrans visceralis and larva migrans ocularis

Virology

186. Give at least 2 examples for DNA viruses!

    Adenoviruses, Herpesviruses, Poxviruses, Parvoviruses, Papillomavirus

187. Give at least 2 examples for RNA viruses!

    Flaviviruses, Retroviruses, Togaviruses, Caliciviruses, Picornaviruses, Coronaviruses, Orthomyxoviruses, Paramyxoviruses

188. How can we culture viruses?

    In living animals, embryonated eggs, tissue cultures (they require living cells)

189. What can Adenoviruses cause (3 examples)?

Pharingitis, pneumonia, pertussis syndrome, pharyngoconjunctival fever, acute haemorrhagic cystitis, gastroenteritis

190. What kind of tumours can be caused by Papillomaviruses?

cervical cancer, laryngeal papilloma, oropharyngeal carcinoma

191. Which drug can be used to treat HSV-1 and HSV-2 infection?

Acylovir

192. What diseases are caused by VZV (Varicella Zoster virus)?

varicella (chicken pox), zoster (shingles)

193. Is there any vaccination against chicken pox?

Yes, containing live attenuated virus. It will be obligatory in Hungary from September 2019.

194. What diseases are caused by EBV (Epstein-Barr virus)? (2 examples)

mononucleosis infectiosa, Burkitt lymphoma, nasopharyngeal carcinoma, oral hairy leukoplakia

195. Which viruses can cause congenital infection? (2 examples)

Rubella, CMV, Parvo B19, VZV, HSV-2, HIV

196. What is the transmission of Hepatitis B virus?

parenteral (blood, sexual contact and perinatal)

197. What is the transmission of Hepatitis C virus?

parenteral (blood, sexual contact and piercing)

198. Against which hepatitis viruses do we have vaccination?

Hepatitis B (recombinant) and Hepatitis A (inactivated)

199. Which hepatitis viruses spread feco-orally?

Hepatitis A and E

200. List at least 2 viruses causing gastroenteritis!

Calicivirus, Rotavirus, Adenovirus

201. List at least 2 Flaviviruses!

Yellow fever, Dengue-fever, tick-borne encephalitis virus (TBE), Zikavirus

202. What does it mean: arbovirus?

A virus which is spread by insect vectors

203. List at least 2 arboviruses!

Yellow fever, Dengue-fever, tick-borne encephalitis virus (TBE), Zikavirus, West-Nile virus, Chikungunya virus

204. What are the 5 classic exanthemic viral infections? (3 examples)

Measles, rubella, chicken pox, Parvovirus B19, HHV-6 (Roseola infantum or exanthema subitum)

205. What can be the neurological consequence of measles infection?

SSPE (subacute sclerotising panencephalitis)

206. Against which diseases is MMR vaccine used and what does it contain?

Mumps, measles, rubella. It contains live, attenuated viruses.

207. What type of drugs are used in the HIV treatment?

Nucleotide analogues and protease inhibitors in combination

208. What are the vaccines against poliomyelitis?

IPV (=Salk-vaccine, inactivated virus) and OPV (=Sabin droplets, live attenuated virus)

209. Which is the only disease, so far successfully eradicated from the World?

Smallpox (Variola vera)

210. What are the 2 major surface antigens of influenza virus?

Hemagglutinin (H) and neuraminidase (N)