

FRHS – MICROBE MISSION EXAM KEY – CAPTAIN’S TRYOUTS
2017

Total Points: 117 pts

1. (1 pt) *Accept any of the following:* Stereo Microscope, Stereoscopic Microscope, Dissecting Microscope
2. (1 pt) *Accept any of the following:* Differential-Interference Microscope, Differential-Interference Contrast Microscope, Nomarski Interference Contrast Microscope, Nomarski Microscope
3. (1 pt) Bright Field Microscope
4. (1 pt) Phase Contrast Microscope
5. (1 pt) *Accept any of the following:* Dark Field Microscope, Dark Ground Microscope
6. (1 pt) *Accept any of the following:* Confocal Microscope, Confocal Laser Scanning Microscope
7. (1 pt) Scanning Electron Microscope (SEM)
8. (1 pt) Transmission Electron Microscope (TEM)
9. (1 pt) *Accept any of the following:* Fluorescence Microscope, **Epifluorescence Microscope (+1 bonus point)**
10. (2 pts – 1 pt/advantage) *Some possible answers; response may not be listed:* Greatly increased specimen penetration (2-3x more than confocal microscopy), minimization of photobleaching & photodamage, application with living cells (embryology, physiology, neurology, etc.), flexibility in detection geometry, **(do not accept increased resolution)**
11. (1 pt) 750 μm
12. (1 pt) 0.75 mm, $\frac{3}{4}$ mm
13. (1 pt) 1.6 cells
14. (3 pts - $\frac{1}{2}$ point for each correct answer)
 - a. decreases
 - b. darker
 - c. increases
 - d. increases
 - e. decreases
 - f. decreases
15. (1 pt) Porins (stalkless particles)
16. (1 pt) Outer membrane
17. (1 pt) Inner membrane
18. (1 pt) Intermembrane space
19. (1 pt) Matrix
20. (1 pt) Ribosome
21. (1 pt) mRNA + polysome (award 0.5 point if only one is mentioned)
22. (1 pt) Granule **(+1 bonus point if participant writes calcium phosphate)**
23. (1 pt) Circular DNA Molecule
24. (1 pt) ATP Synthase (stalked particle), F_1 particle

25. (1 pt) Electron Transport Chain (ETC), F_0 particle
26. (1 pt) Cristae
27. – 30. (1 pt for location of each, 1 pt for function of each, 4pts total) Stalked particles are distributed over the outer surface of the outer membrane of mitochondria. +1 Their function involves various oxidation reactions, supplying electrons to the interior of the organelle, and allowing ATP to leave the mitochondrion. +1 Stalked particles are present on the inner surface of the inner membrane. +1 They transfer electrons along a chain of complexes, synthesizing ATP. +1
31. (1 pt) ATP-ADP translocase
32. (1 pt) Proteobacteria
33. (1 pt) Cyanobacteria
34. (1 pt) B (syntrophic model)
35. (4 pts – ½ point each) Prions, viruses, bacteria, archaea, fungi, algae, protozoa, parasitic worms/helminths
36. (1 pt) Application of crystal violet (purple dye)
37. (1 pt) Application of Gram's iodine solution (mordant)
38. (1 pt) Ethyl alcohol/acetone wash (decolorization)
39. (1 pt) Application of safranin (counterstain)
40. (1 pt) Hans Christian Gram
41. (1 pt) Archaea
42. (1 pt) Nanometers (nm)
43. (3 pts; ½ point for each category and example) *Must list the following 3 categories, but examples may be different – there are many possible examples. Look up competitor's answer to see if it is correct!* Helical (e.g. plant tobacco mosaic virus or TMV), Icosahedral/polyhedral (e.g. poliovirus), Complex (e.g. any of the poxviridae)
44. (1 pt) Prions
45. (2 pts – 1 pt for definition, 1 pt for valid example) A satellite virus is a defective viruses which can multiply only by association with a helper virus which complements the defective gene. *Examples may include, but are not limited to:* Sputnik virophage, Zamilon virophage, Mavirus virophage, Organic Lake virophage, Tobacco mosaic satellite virus
46. (4 pts total – 1 pt for each layer, 0.5 pt for each location) Layers: lipoidal inner layer, chitinous middle layer, outer proteinic layer. Location of eggs may include crops, soil, fresh water, sewage, feces, fecal sludge, sewage sludge
47. (4 pts - ½ point for each correct answer)
 - a. neither
 - b. neither
 - c. prokaryote
 - d. prokaryote
 - e. eukaryote
 - f. eukaryote
 - g. eukaryote
 - h. eukaryote

48. (1 pt) Cocci
49. (1 pt) Diplococci
50. (1 pt) Streptococci
51. (1 pt) Sarcinae (tetrads)
52. (1 pt) Staphylococci
53. (1 pt) Bacilli
54. (1 pt) Streptobacilli
55. (1 pt) Spirochetes
56. (1 pt) Vibrios
57. (1 pt) Coccobacilli
58. (1 pt) C
59. (1 pt) A
60. (1 pt) B
61. (1 pt) C
62. (1 pt) B
63. (1 pt) B
64. (1 pt) E
65. (1 pt) B
66. (1 pt) B (PrP^C, PrP^{Sc})
67. (1 pt) D (infectious mononucleosis)
68. (1 pt) A (West Nile Fever)
69. (1 pt) B (Schistosomiasis)
70. (1 pt) C (*C. trachomatis*)
71. (1 pt) B (Nitazoxanide)
72. (1 pt) D (Dental caries)
73. (1 pt) A (Carbendazim phosphate)
74. (1 pt) B (35°C)
75. (1 pt) B (Syphilis)
76. (1 pt) B (Tender lymphadenopathy)
77. (1 pt) D (Dengue Fever)
78. (1 pt) C (HIV/AIDS)
79. (1 pt) A (Small pox)
80. (1 pt) D (Rocky Mountain Spotted Fever)
81. (1 pt) B (Chlorine dioxide gas)
82. (1 pt) B (Methicillin-resistant *Staphylococcus aureus*)
83. – 92. (10 pts – follow rubric in bold) The microbe pictured causes thrush. **+1 Award one bonus point if participant writes “oral candidiasis, oropharyngeal candidiasis, oral moniliasis, or candidal stomatitis.”** Symptoms may include creamy white bumps on tongue, inner cheeks, gums, or tonsils; slight bleeding when bumps are scraped; pain at bumps; dry, cracked skin at corners of mouth; difficulty swallowing (dysphagia); metallic, acidic, salty or bitter taste in mouth; hoarse voice. **+2 if at least 4 symptoms are named.** Host defenses in humans may include the oral epithelium, acting as a physical barrier and the site of cell mediated immune reactions; competition/inhibition

interactions between the microbe and other microbes in the mouth; or saliva, which has cleansing and immunologic action. **+2 if at least 2 host defenses are described.** Apart from the clinical appearance, diagnosis may include revealing an erythematous surface underneath the membranous slough; a diffuse border; oral swabs, oral rinse, and oral smears; presence of hyperplastic epithelium with superficial parakeratotic desquamating layer; presence of hyphae in stratum spinosum; presence of polymorphonuclear cells in the epithelium; presence of chronic inflammatory cells in the lamina propria; dysplasia. **+2 if at least 2 diagnostic techniques apart from the clinical appearance are given, or +1 if the clinical appearance and 1 diagnostic technique is given.** Thrush is treated with topical anti-fungal drugs like nystatin, miconazole, Gentian violet, or amphotericin B. Oral or intravenous anti-fungals may be required. Oral hygiene methods such as tooth brushing and using anti-microbial mouthwashes, and stopping smoking may treat disease. **+2 if at least 2 categories of treatment given, award points on specificity.** *Candida albicans* is the fungus involved in 50% of cases. **+1, must be specific.**

93. (1 pt) Lag phase
94. (1 pt) Log/exponential growth phase
95. (1 pt) Stationary phase
96. (1 pt) Death/logarithmic decline phase
97. (1 pt) C
98. (1 pt) A
99. (1 pt) One-step phage growth curve
100. (1 pt) Latent period
101. (1 pt) Eclipse period
102. (1 pt) The number of phages produced per infected bacterium or on average across of a population of phage infections.