

Respiratory System

1. (1) 4
2. (1) 2
3. (1) 6
4. (1) 7
5. (1) 10
6. (1) 8
7. (1) B
8. (1) A
9. (0.5) Meati
10. (1) D
11. (1) E
12. (1) E
13. (+1 pt for C, -0.5 pt for each incorrect answer. Opt minimum) C
14. (+1 pt for B, -0.5 pt for each incorrect answer. Opt minimum) B
15. (1 pt all correct. +0.5 for B, +0.5 for C. -0.5 pt for incorrect answers. 0 pt minimum) B, C
16. (1 pt all correct. +0.33 for each correct answer, -0.33 for incorrect. 0 pt minimum). A, B, C
17. (1 pt for B and C, 0 pt otherwise) B, C
18. (1) D
19. (1) A
20. (2) B
21. **3 pts:

1. Example answer: "After the snake is treated with the drug, I will use the electric current to stimulate the respiratory muscles. I expect this stimulation to cause expiration. Then, I will remove the electric current. If inspiration is passive, I expect to see a full return to the original lung volume. If inspiration is active, the lungs might not return to the full volume.
 2. 0.5 pt: mentions using electric current to stimulate muscles after drug
 3. 0.5 pt: mentions current stimulation will induce expiration
 4. 1 pt: expectation for passive inspiration is return to original lung volume
 5. 1 pt: expectation for active inspiration is incomplete lung fill, other explanations possible
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22. (1) B
 23. (1) A
 24. (1) C
 25. (1) D
 26. (1) B
 27. (1) B
 28. (1) A
 29. (1) C
 30. (1) B
 31. (1) D
 32. (1) E
 33. (1) H
 34. (1) C
 35. (1) E
 36. (2)

1. 1 pt: Airflow (F) should decrease as a result of increased resistance (R).
 2. 0.5 pt Increased resistance (R) occurs as the bronchioles narrow
 3. 0.5 pt: when the smooth muscles constrict.
37. (2) 1 pt each: Length of tube, width of tube, smoothness of tube.
38. (2**) C
39. (2)
1. 0.5 each: dissolved gas, as carbonic acid, and bound to hemoglobin
 2. 0.5 pt: Most carbon dioxide is carbonic acid
40. (1) A
41. (1) 50% (+/- 5% is fine)
42. (2) 1 pt each: Lower pH, higher CO₂ concentration, lower temperature
43. (1) About 10-15%
44. (2) 0.5 pt each, bonus 0.5 pt (to 2.5pt max) if they included both carbon dioxide and H⁺
1. Carbon dioxide or H⁺
 2. Oxygen
 3. Oxygen
 4. Carbon dioxide or H⁺
45. (3)
1. 1 pt: the greater the concentration of oxygen, the less affinity hemoglobin has for carbon dioxide (or the lower conc of oxygen, the greater affinity for CO₂).
 2. 0.5 pt: In the lungs, there is a high conc of oxygen
 3. 0.5 pt: so hemoglobin will be more likely to release CO₂ to the alveoli
 4. 0.5 pt: in the body tissues, there is a lower conc of oxygen
 5. 0.5 pt: so hemoglobin will be more likely to pick up CO₂ from the body tissues
46. (2) (0.66 pt for each correct answer, -0.66 for incorrect answers.) A, B, C
47. (1) C
48. (2) E
49. (1) D
50. (0.5) False

51. (0.5) True

52. (0.5) True

53. (0.5) True

54. (0.5) True

Digestive System

55. (1) A

56. (1) E

57. (1) C

58. (1) 32

59. (1) Salivary gland

60. (2) 1 pt each: mixing food, swallowing, taste, speech production

61. (2)

1. 1 pt: herbivore
2. 1 pt: correct explanation for given answer. E.g. herbivore because many molar-like teeth for grinding and crushing vegetation, and lack of sharp canine.

62. (1) C

63. (1) F

64. (1) 7

65. (1) 9

66. (1) 11

67. (1) 4

68. (1) 5

69. (1) 4

70. (1) 6

71. (0.5) A

72. (0.5) H

73. (0.5) E

74. (0.5) J

- 75. (0.5) F
- 76. (0.5) K
- 77. (0.5) B
- 78. (0.5) I
- 79. (0.5) E
- 80. (0.5) J
- 81. (0.5) F
- 82. (0.5) K
- 83. (1) B
- 84. (1) B
- 85. (1) A
- 86. (1) C
- 87. (2) IV, I, V, VI, II, III
- 88. (1) A
- 89. (1) D
- 90. (1) D
- 91. (1) C
- 92. (1) B
- 93. (2**) D
- 94. (1) D
- 95. (2)

1. 1 pt: a zymogen is an inactive precursor form of an enzyme that is activated by other enzymes.

2. 1 pt: secreting digestive enzymes in the form of inactive zymogens helps prevent enzymes from digesting the cells of the secretory organ (stomach, pancreas etc)
96. (2) 1 pt each example, including: Pepsinogen, trypsinogen, chymotrypsinogen
97. (2, -0.5pt each incorrect) A or A, D
1. Just D gives no points
98. (2, +1 pt each correct, -0.5 pt each incorrect) A, E
99. (2; +0.5 pt each correct, -0.5 pt each incorrect) A, B, C, D
100. (1) A
101. (1) B
102. (1) D
103. (1) C
104. (1; +0.5 pt each correct, -0.5 pt each incorrect) B, C

Immune System

- 105. (1) B
- 106. (1) D
- 107. (1) C
- 108. (1) A
- 109. (1) B
- 110. (1) D
- 111. (1) A
- 112. (0.5) B
- 113. (0.5) A
- 114. (0.5) A
- 115. (0.5) A
- 116. (0.5) A
- 117. (0.5) B
- 118. (1) C
- 119. (1) F
- 120. (1) B
- 121. (1) D
- 122. (1) A
- 123. (1) C
- 124. (1) C
- 125. (1) G (IgG)
- 126. (1) A (IgA)

127. (1) E (IgE)

128. (1) G (IgG)

129. (1) M (IgM)

130. (1) D (IgD)

131. (1) C

132. (1) B

133. (2)

1. 1 pt: antigens presented using MHC class I are cytosolic in nature
2. 1 pt: antigens presented using MHC class II are extracellular in nature

134. (1) B

135. (1) C

136. (1) D

137. (1) E

138. (1) H

139. (2) D

140. (2**) B

141. (1) B

142. (2) II, V, III, I, IV

1. Okay if II, V, I, III, IV

143. (1 only if all correct) A, B, C, D

144. (1) E

145. (1) E

146. (1) B
147. (1) D
148. (1) D
149. (1) A
150. (1) C
151. (1) B
152. (2) 1 pt each: Increased blood flow / dilation of capillaries, permeabilization of blood vessels
153. (1) Neutrophils
154. (2) III, II, V, I, IV, VI
155. (1) B
156. (1) E
157. (1) E
158. (2**) Examples may include: an innate phagocyte such as a dendritic cell presents an antigen for recognition by a T cell (adaptive response); B1 cells which have an innate set of antibodies that are secreted, etc.

Diseases and Disorders

159. (2; +0.66 pt correct answer, -0.66 incorrect) C, D, E
160. (2)
- 1 pt: patients are unable to exhale completely (reduced expiratory volume)
 - 1 pt: because damage to lung tissue reduces the ability to recoil
 - OR, compliance is increased which reduces ability to recoil
161. (1) A
162. (1 only if all correct) A, B, D
163. (3**)
- 1 pt: vaccination provides a first exposure to a weakened virus or viral particles
 - 1 pt: first exposure results in the formation of memory B and memory T cells
 - 1 pt: upon second exposure to actual hepatitis virus, memory B and memory T cells will rapidly proliferate to generate a STRONGER and FASTER immune response
164. (1, 0.5 each) Answers include: Large amounts of alcohol consumption, autoimmune diseases, some medications, toxins
165. (1) D
166. (1) I
167. (1) N
168. (1) A
169. (1) F
170. (1) C
171. (1) F
172. (1) L
173. (1) M
174. (1) B
175. (1) O

Microscope station

176. (1) Answer will be determined on site when microscope station is set up
177. (1) Answer will be determined on site when microscope station is set up
178. (1) Answer will be determined on site when microscope station is set up
179. (1) Answer will be determined on site when microscope station is set up
180. (1) Answer will be determined on site when microscope station is set up
181. (2) 1 pt each: digestive enzymes such as lysozymes for destroying antigens that are phagocytosed, cytokines such as interleukins for signaling to other immune cells
182. (2)
1. 1 pt: low protein production
 2. 1 pt: condensed chromatin means DNA is not readily accessible to transcription factors, RNA polymerase, etc.
183. (1) B
184. (1) Goblet cells
185. (2) 1 pt: mucus helps protect against acidic stomach acid and acidic chyme; 1 pt: mucus helps lubricate food as it moves through the gastrointestinal tract
186. (1) 0.5pt each: reproductive system, respiratory system
187. (2)
1. 1 pt: chloride shift exchanges chloride ions (Cl^-) for bicarbonate ions (HCO_3^-)
 2. 1 pt for digestive system: In the digestive system, chloride shift produces HCl which is secreted into the stomach (0.5 pt) by formation of H_2CO_3 from carbon dioxide and water in parietal cells—the HCO_3^- ion is then exchanged for chloride from the bloodstream, and Cl^- transported is transported into the stomach lumen (0.5 pt)
 3. OR 1 pt for respiratory system: chloride shift occurs in red blood cells (0.5 pt). CO_2 dissolves to form HCO_3^- in red blood cells, which is then exported into the blood stream in exchange for chloride from the blood stream, maintain electrical balance (0.5pt).
188. (1) B
189. (1) C