



**SCIENCE OLYMPIAD**  
— AT THE —  
**UNIVERSITY OF FLORIDA**

Northern Regional: January 19<sup>th</sup>, 2019

# Anatomy and Physiology B Answer Key

Name(s): \_\_\_\_\_

Team Name: \_\_\_\_\_

School Name: \_\_\_\_\_

Team Number: \_\_\_\_\_

**Rank:** \_\_\_\_\_

**Score:** \_\_\_\_\_

**NORTHERN REGIONAL SCIENCE**  
**OLYMPIAD 2019**

*Anatomy and Physiology Division B*  
*ANSWER KEY: Cardiovascular,*  
*Lymphatic, and Excretory Systems*

- |    |                                    |   |
|----|------------------------------------|---|
| 1. | A. Collecting Duct (Accept Ureter) | 4. A  |
|    | B. Descending Loop of Henle        | 5. B  |
|    | C. Ascending Loop of Henle         | 6. D  |
|    | D. Renal Vein                      | 7. D  |
|    | E. Glomerulus                      | 8. B  |
|    | F. Bowman's Capsule                | 9. B  |
|    | G. Renal Artery                    | 10. E   |
|    | H. Proximal Convoluted Tubule      | 11. D   |
|    | I. Distal Convoluted Tubule        | 12. C   |
|    | J. Vasa Recta                      | 13. D   |
|    | K. Cortex                          | 14. A   |
|    | L. Medulla                         | 15. A   |
| 2. |                                    | 16. E   |
|    | A. TONSILS                         | 17. A   |
|    | B. CERVICAL LYMPH NODES            | 18. C   |
|    | C. THORACIC DUCT                   | 19. D   |
|    | D. THYMUS                          | 20. B   |
|    | E. SPLEEN                          | 21. A   |
|    | F. PEYER'S PATCHES (IN             | 22. C   |
|    | INTESTINE)                         | 23. C   |
|    | G. INGUINAL LYMPH NODES            | 24. B   |
|    | H. LYMPHATIC VESSELS               | 25. D   |
|    | I. BONE MARROW                     | 26. A   |
|    | J. CISTERNA CHYLI                  | 27. C   |
|    | K. AXILLARY LYMPH NODES            | 28. D   |
|    | L. RIGHT LYMPHATIC DUCT            | 29. C   |
| 3. |                                    | 30. A   |
|    | 1. R                               | 31. C   |
|    | 2. P                               | 32. E   |
|    | 3. Q                               | 33. B   |
|    | 4. S                               | 34. E   |
|    | 5. T                               | 35. B   |
|    | 6. P WAVE                          | 36. E   |
|    | 7. QRS COMPLEX                     | 37. A   |
|    | 8. T WAVE                          | 38. C   |
|    | 9. NORMAL WAVE PATTERN             | 39. A   |
|    | 10. TACHYCARDIA                    | 40. B   |
|    | 11. BRADYCARDIA                    | 41. A   |
|    | 12. ARRHYTHMIA                     | 42. B   |
|    |                                    | 43. Artery (1) = thicker walls, narrower<br>space; Vein (2) = thinner walls, more<br>lumen space. |

- 44. C
- 45. A
- 46. C
- 47. B
- 48. A

49. 5 possible points:

- a. When an individual is dehydrated, water levels in the blood plasma decrease, decreasing BP.
- b. Renin is released from the kidney in response to low BP and increases water reabsorption to raise blood volume and BP.
- c. Renin Causes Angiotensin II to be created (3 bonus points if the chemical cascade from Renin to ACE to Angiotensin I to Angiotensin II is explained) which constricts blood vessels to raise BP.
- d. Aldosterone stimulates sodium uptake in the distal convoluted tubules
- e. With more sodium reabsorbed into the bloodstream, more water is reabsorbed from the collecting ducts via osmosis
- f. This functions to raise blood volume and hence increases blood pressure

50. 6 Possible Points:

- a. First part 2 points): Descending limb; Distal Convoluted Tubule (2 points)
- b. Second Part (4 points): As long as they explain the answer properly and it makes sense, points should be given. Possible interpretations include the following
  - i. The distal convoluted tubule had to be dragged down to meet the end of the descending loop and became the new ascending limb. The tissue altered itself to match the environment (the highly concentrated medulla) and now there is less length in the distal convoluted tubule so less solutes (chloride, sodium, calcium) would be reabsorbed, and the pH of the urine would be less buffered by bicarbonate.
  - ii. The descending loop would be lifted to connect to the distal convoluted tubule, but since it is not very permeable to ions and urea, sodium and chlorine won't be able to diffuse out and the concentration gradient of the medulla will be altered. The Urine would likely be more concentrated.

51. 4 possible points:

- a. Lymphedema, as the name implies, is an edema caused by a buildup of lymph fluid.
- b. The **swelling** will most likely happen around the arms or legs.
- c. This is most likely due to a blockage in the draining system of lymph and can be induced through damage or removal of the lymph nodes.
- d. There is no cure and surgery/cancer radiotherapy can result in lymphedemas.

52. 2 Possible Points:

- a. Enlarged/inflamed Adenoids; Adenoidectomy or Nasal Steroids

53. 53a. 3 possible points:

1 pt for correct equation ( $SV = EDV - ESV$ )

1 pt for correct calculation ( $100 - 50 = 50$ )

1 pt for correct units with answer - award point for units even if incorrect calculation (mL/beat)

53b. 3 possible points:

1 pt for correct equation ( $CO = \text{Heart rate} \times \text{Stroke volume}$ )

1 pt for correct calculation ( $75 \times 70 = 5250$ )

1 pt for correct units with answer - award point for units even if incorrect calculation (mL/min)

53c. 4 possible points:

2 pts for correct identification of Cardiac Output (CO) being within normal range of 4.0-8.0 L/min

1 pt for correct identification of Stroke Volume not being within normal range of 60-100 mL/beat, and 1 more pt. for stating that Dave's SV is too low.

\*\*Note: Follow through on errors. If students make errors in calculations but correctly identify whether the wrong answer they got is in the correct range or not and why, then still award them the two full points for each part.\*\*