



SCIENCE OLYMPIAD
— AT THE —
UNIVERSITY OF FLORIDA

Northern Regional: January 19th, 2019

Anatomy and Physiology C Answer Key

Name(s): _____

Team Name: _____

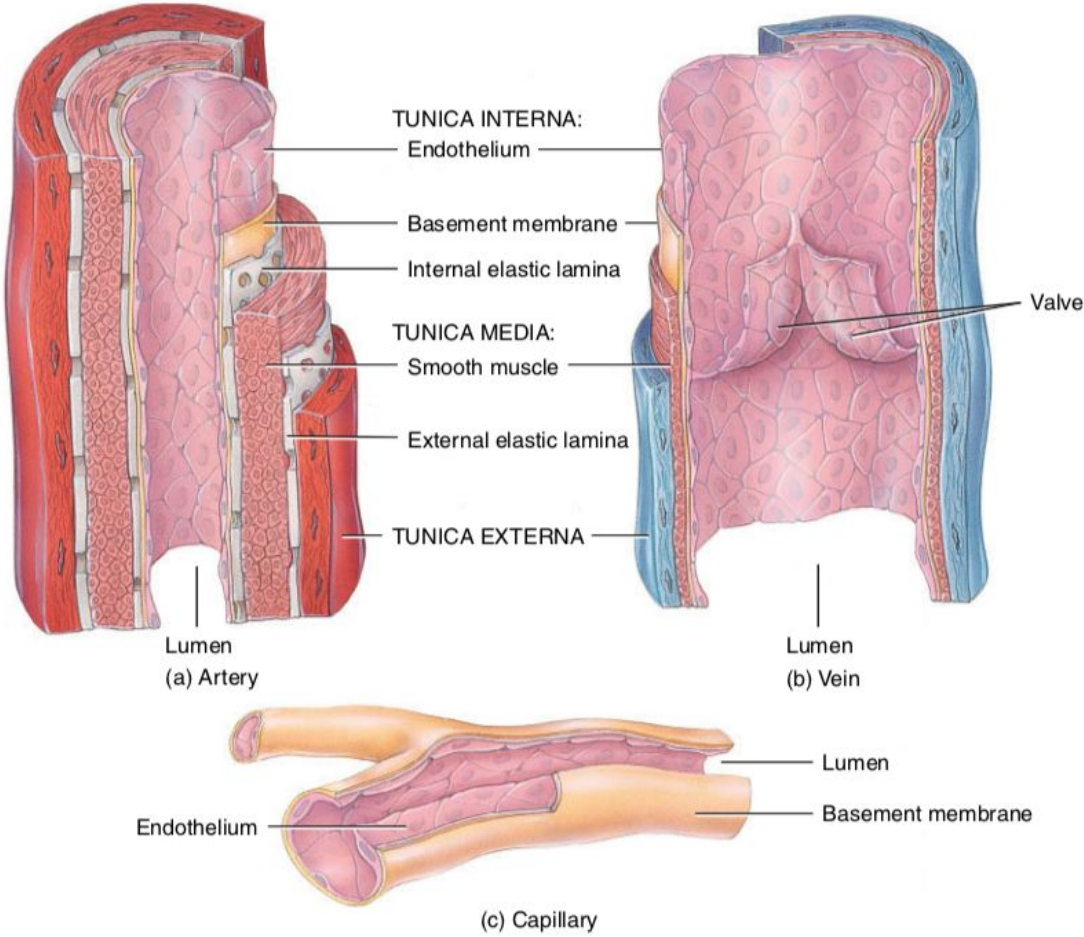
School Name: _____

Team Number: _____

Rank: _____

Score: _____

Station 1 - Part 1



Station 1- Part 2

1. Congestive heart failure
2. Congestive heart failure
3. Bradycardia
4. Myocardial Infarction
5. Congestive heart failure
6. Bradycardia
7. Myocardial Infarction
8. Atrial fibrillation
9. Bradycardia
10. Atrial fibrillation
11. Bradycardia
12. Atrial fibrillation
13. Atrial fibrillation
14. Bradycardia
15. Myocardial Infarction
16. Bradycardia
17. Bradycardia
18. Myocardial Infarction
19. Bradycardia
20. Atherosclerosis
21. Atherosclerosis
22. Myocardial Infarction
23. Bradycardia
24. Atrial Fibrillation
25. Tachycardia
26. Atrial Fibrillation
27. Tachycardia
28. Atherosclerosis
29. Tachycardia
30. Tachycardia

Station 2 - Part 1

1. True
2. A, b, c
3. A
4. B
5. A
6. Hematocrit
7. Red blood cells, white blood cells, and platelets
8. Cooperativity
9. A **blood sample** is needed. The test to determine your blood group is called ABO typing (1 point). Your blood sample is mixed with antibodies against type A and B blood (1 point). Then, the sample is checked to see whether or not the blood cells stick together (1 point). If blood cells stick together, it means the blood reacted with one of the antibodies. (1 point)

The second step is called back typing (1 point). The liquid part of your blood without cells (serum) is mixed with blood that is known to be type A and type B (1 point). People with type A blood have anti-B antibodies (1 point). People with type B blood have anti-A antibodies. Type O blood contains both types of antibodies. (1 point)

The 2 steps above can accurately determine your blood type.

10. Back typing

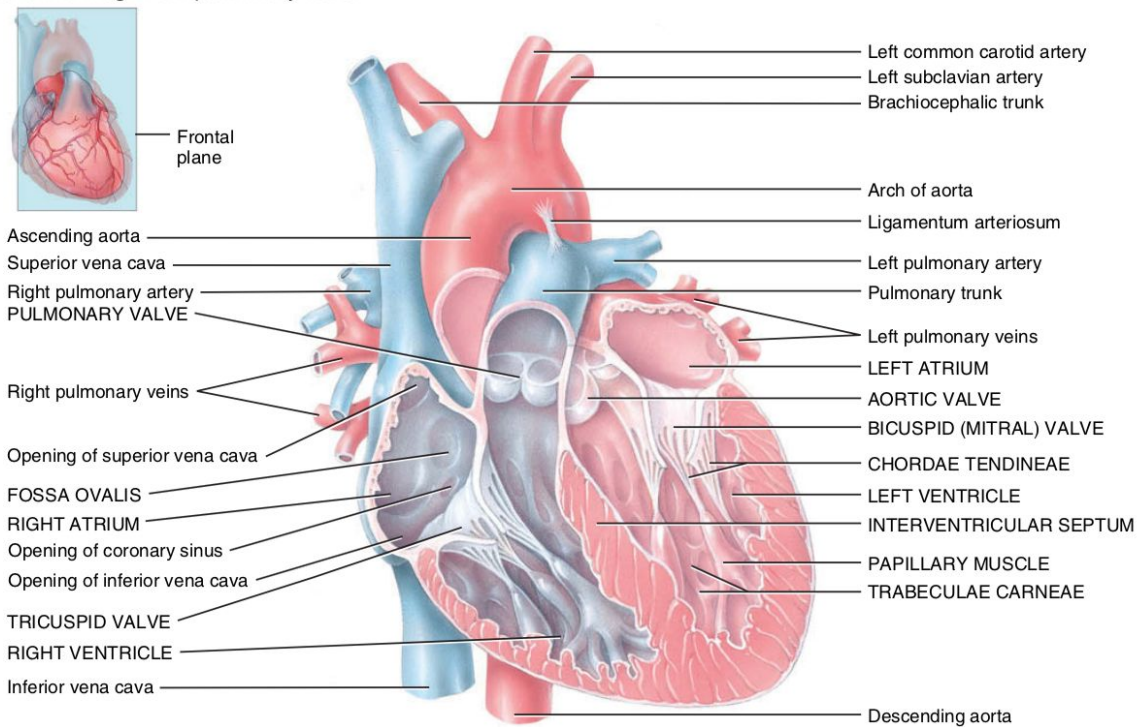
Station 2 - Part 2 (70 points)

1. Formation of prothrombinase, conversion of prothrombin into thrombin, and conversion of soluble fibrinogen into insoluble fibrin.
2. False
3. K, clot retraction, fibrinolysis
4. thrombosis
5. A thrombus that moves from its site of origin
6. antigen-antibody
7. +, -
8. When an Rh - mother is pregnant with an Rh + fetus
9. Starling's law of the capillaries
10. Edema
11. Inversely, slowest, decreases, increases
12. Blood pressure and resistance
13. Higher, lower
14. True
15. Pressure exerted on the walls of a blood vessel
16. Venules and right
17. Skeletal muscle contractions, valves in veins (especially in limbs) and pressure changes associated with breathing

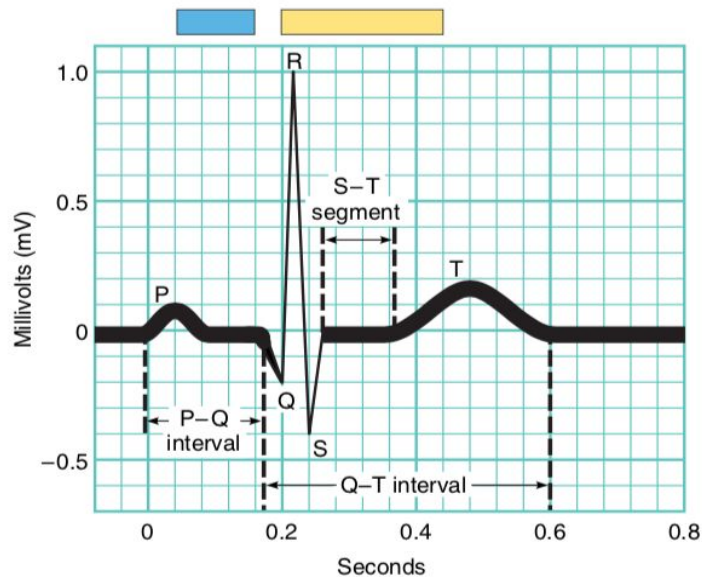
Station 3 - Part 1 (74 points)

EACH CORRECT LABEL IS WORTH 2 POINTS.

Diagram 1 - 60 points; Diagram 2 - 14 points)



(a) Anterior view of frontal section showing internal anatomy



Key:

- Atrial contraction
- Ventricular contraction

Station 3 - Part 2 (35 points)

1. Parietal and visceral
2. Reduces friction between the two membranes
3. d
4. Atria, ventricles
5. Superior vena cava, inferior vena cava, coronary sinus
6. Fossa ovalis
7. tricuspid
8. interventricular
9. Pulmonary, bicuspid
10. Left ventricle
11. pulse
12. b
13. Blood pressure
14. Blood pressure
15. SBP: systolic blood pressure (1); arterial blood pressure during ventricular contraction (1). DBP: diastolic blood pressure (1) ; arterial blood pressure during ventricular relaxation (1)
16. True

Lymphatic System

I hope this exam doesn't drain too much of your energy.

Station 4 - Part 1 (25 points)

1. Drains interstitial fluid, transports dietary lipids, protects against invasion through immune responses
2. Closed-ended; interstitial fluid, lymph
3. Lymphatic vessels
4. Convey lymph into and out of lymph nodes
5. Lymphatic capillaries → lymphatic vessels → lymph trunks → thoracic duct/left lymphatic duct → right lymphatic duct → subclavian veins

Station 4 - Part 2 (25 points)

1. Skeletal muscle contractions (1) and respiratory movements (1)
2. valves
3. False
4. False
5. Thymus
6. T
7. Lymph nodes
8. Afferent, efferent
9. spleen
10. B cells and T cells
11. Macrophages
12. Mucosa-associated lymphatic tissue

Station 5 - Part 1 (20 points)

Instructions: The descriptions and pictures below refer to a lymphatic disease. Determine if it is referring to lymphedema, Hodgkin lymphoma, non-Hodgkin lymphoma, Lymphadenopathy

1. Lymphedema
2. Hodgkin
3. Lymphadenopathy
4. Lymphadenopathy
5. lymphedema
6. Hodgkin
7. Non-Hodgkin
8. Lymphedema
9. Lymphedema
10. Lymphedema

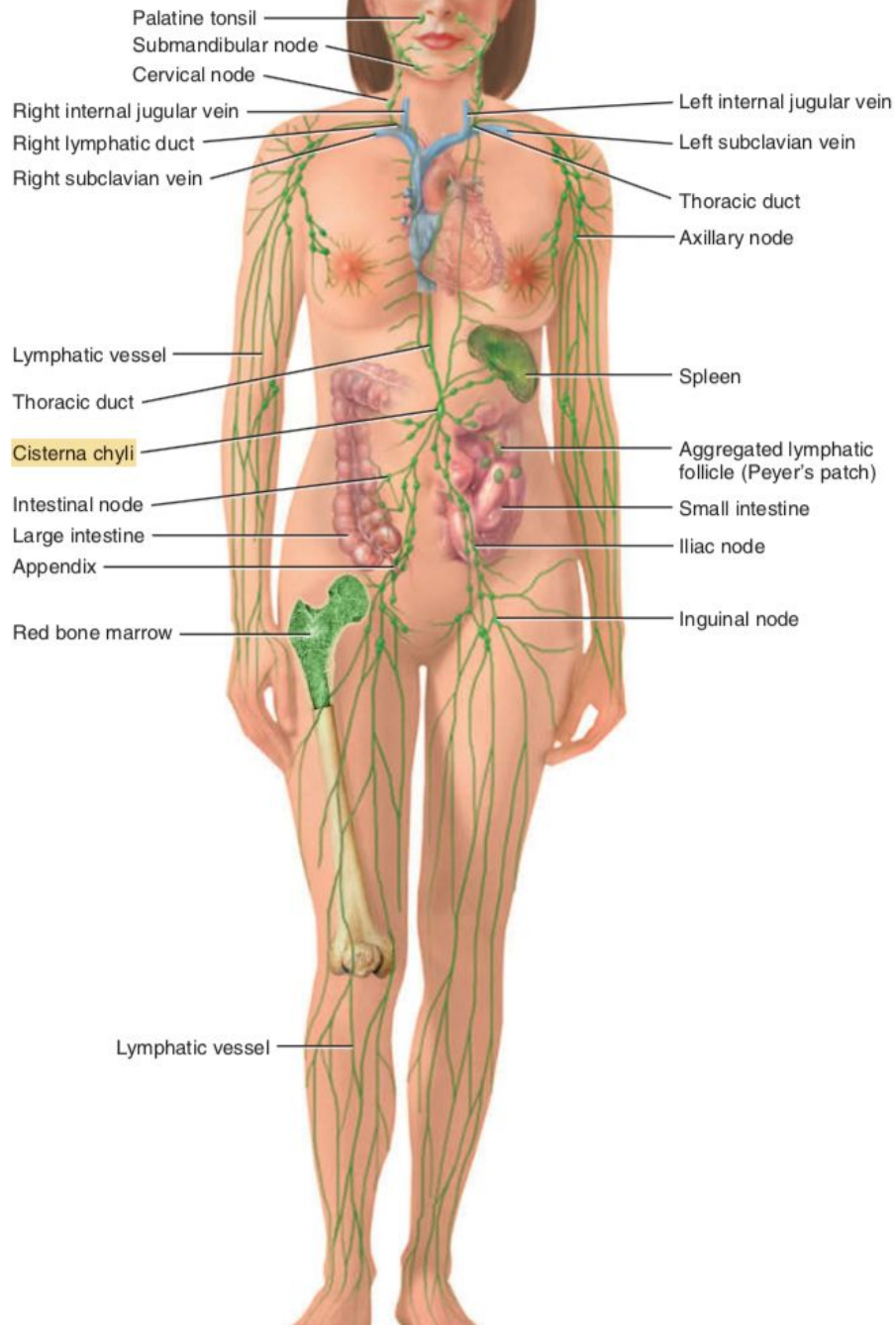
Station 5 - Part 2 (66 points)

EACH CORRECT LABEL IS WORTH 2 POINTS.

Diagram 1 - 46 points; Diagram 2 - 20 points

The lymphatic system consists of lymph, lymphatic vessels, lymphatic tissues, and red bone marrow.

2. Transports dietary lipids from
3. Protects against invasion thro



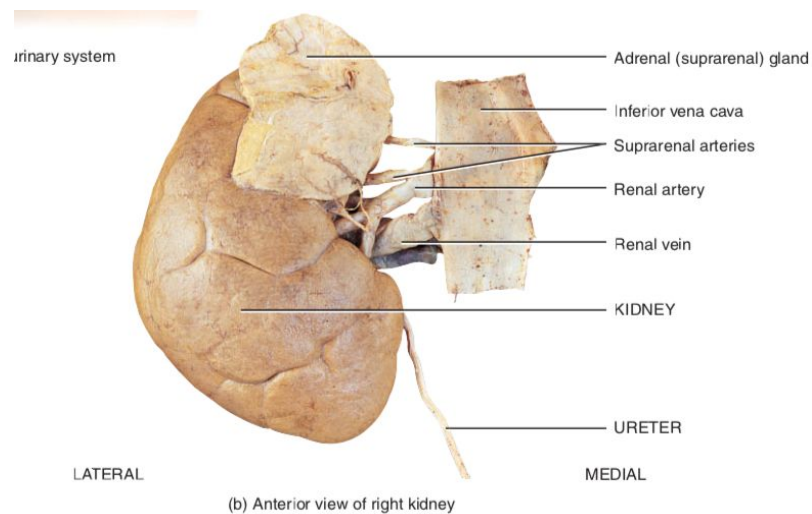
Excretory System

I'm not kidding when I say that urine for a treat.

Station 6 - Part 1 (20 points)

1. Ionic composition, blood osmolarity, blood volume, blood pressure, and pH
2. A, b, c
3. Glomerular filtration, tubular secretion, tubular reabsorption

4. EACH LABEL IS WORTH ONE POINT.



Station 6 - Part 2 (50 points)

1. Retroperitoneal, posterior
2. Renal capsule, adipose capsule, renal fascia
3. Renal cortex, renal medulla, renal pyramids, renal papillae, renal columns, major and minor calyces, renal levis
4. Renal artery → segmental artery → interlobar artery → arcuate artery → cortical radiate arteries → afferent arterioles -- glomerular capillaries → efferent arterioles → peritubular capillaries and vasa recta → cortical radiate vein → arcuate vein → interlobar veins → renal vein
5. vasomotor
6. Flow of blood through the kidney
7. Nephron; renal corpuscle (glomerulus and glomerular capsule) and a renal tubule.
8. A renal tubule consists of a proximal convoluted tubule, a nephron loop, and a distal convoluted tubule.
 - a. Collecting duct
 - b. True
 - c. Descending limb and an ascending limb
9. Short, superficial, long.
10. False
11. Juxtaglomerular apparatus

Station 7 - Part 1 (40 points)

1. Capsular; glomerular filtrate
2. Glomerular endothelium, basal lamina, filtration slits
 - a. Filtration slits
3. False
4. False
5. b
6. Filter is porous and thin (1), the glomerular capillaries are long (1), capillary blood pressure is high (1)
7. What do the following abbreviations stand for: (Total: 15 points)
 - a. Glomerular blood hydrostatic pressure
 - b. Capsular hydrostatic pressure
 - c. Blood colloid osmotic pressure
 - d. Net filtration pressure
 - e. GBHP
 - f. CHP and BCOP
 - g. $NFP = GBHP - CHP - BCOP$ or $NFP = GBHP - (CHP + BCOP)$
 - h. 10 mmHg
8. GFR is the amount of filtrate formed in both kidneys per minute. (Total: 5 points)
 - a. Glomerular filtration rate
 - b. 102-125 mL/min
9. Renal autoregulation, neural autoregulation, hormonal autoregulation

Station 7 - Part 2 (45 points)

1. Tubular reabsorption
2. Tubular secretion

| Tubular Reabsorption | Tubular Secretion |
|---|--|
| Water, glucose, amino acids, urea, Na ⁺ , Cl ⁻ , K ⁺ , HCO ₃ ⁻ , and PO ₄ ³⁻ | K ⁺ , H ⁺ , NH ₄ ⁺ , urea, creatinine, certain drugs |

3. d
4. c
5. Primary active transport
6. d
7. Na⁺-Cl⁻ symporters
8. Na⁺, K⁺, K⁺
9. Angiotensin II, aldosterone, antidiuretic hormone, atrial natriuretic peptide, parathyroid hormone.

Station 8 - Part 1 (35 points)

1. Dilute, more
2. Concentrated, tubular, interstitial, increasing
3. Countercurrent, concentrated
4. b
5. True
6. Renal clearance
7. A, b, c, d, e, f, g, h

Station 8 - Part 2 (26 points)

1. Retroperitoneal, renal pelvis, urinary bladder
2. False
3. Store urine before micturition
4. The micturition reflex discharges urine from the urinary bladder via parasympathetic impulses. Determine whether or not the following scenario below is due to the reflex. Write "Yes" or "No" on your answer sheet. (9 points total)
 - a. No
 - b. Yes
 - c. Yes
5. urethra
6. True
7. True
8.
 - a. IV
 - b. VI
 - c. V
 - d. III
 - e. I
 - f. II