

STATION 1

Please use the corresponding letter for the correct answer on the scantron sheet.

1. Which of the following is an oxygen-carrying blood cell? 1 pt.
 - a. Granulocyte
 - b. Erythrocyte
 - c. Thrombocyte
 - d. Eosinophil

2. Thrombocytopenia 1 pt.
 - a. Refers to a deficiency of platelets
 - b. Is caused by myelosuppression
 - c. May be accompanied by aplastic anemia
 - d. All of the above are true

3. Which of the following best describes prothrombin and fibrinogen? 1 pt.
 - a. Thrombolytic agents
 - b. Anticoagulants
 - c. Clotting factors
 - d. Plasminogen activators

4. What is the normal pH of blood? 1 pt.
 - a. 7.0 to 7.45
 - b. 7.35 to 7.45
 - c. 6.92 to 7.25
 - d. 7.45-7.80

5. Which of the following is least descriptive of blood? 1 pt.
 - a. The average man has 4-6 L of blood
 - b. The normal pH of blood is 7.45
 - c. oxygenated blood is redder than unoxygenated blood
 - d. Water is three to five times more viscous than blood

6. Which group is incorrect? 1 pt.
 - a. Steps in hemostasis: blood vessel spasm, platelet plug, coagulation
 - b. Antigens: A, B, Rh factor
 - c. Blood cells: fibrinogen, albumin, globulins
 - d. Types of anemia: iron deficiency, pernicious, sickle cell

STATION 2

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7. Which of the following is true about non-specific immunity? 1 pt.
 - a. It protects the body primarily through the actions of the B & T lymphocytes
 - b. The response is to a specific antigen, such as the chickenpox virus
 - c. It is achieved through either cell-mediated immunity or anti-body-mediated immunity
 - d. It includes processes such as inflammation, phagocytosis, and fever

8. Natural killer lymphocytes 1 pt.
 - a. Respond to a single antigen such as the measles virus
 - b. Engage in antibody-mediated immunity (AMI)
 - c. Are considered non-specific immunity
 - d. Are classified as protective proteins similar to interferons and complement

9. The release of histamine is of concern because it 1 pt.
 - a. Elevates blood pressure
 - b. Constricts breathing passages
 - c. binds with IgE antibodies
 - d. binds to mast cells, releasing harmful chemicals

10. Place the following events related to the allergic response in order of occurrence. (you should have 6 letters on the answer sheet in order) (TB3) 6 pts.
 - a. IgE antibodies bind to mast cells
 - b. Mast cells degranulate
 - c. IgE antibodies recognize and bind to allergens
 - d. Allergy symptoms appear
 - e. IgE antibodies are produced in response to exposure to allergens
 - f. Histamine is released into the blood

STATION 3

Please use the corresponding letter for the correct answer on the scantron sheet.

11. Which of the following is a primary organ or structure of the immune system? 1 pt.
- a. Spleen
 - b. Thymus
 - c. Tonsils
 - d. Tonsils
 - e. Appendix
12. Macrophage cells notify other cells of an immunological invader by: (choose the right combination from the selections below) (TB2) 1 pt.
- a. Up-regulating expression of MHC I molecules upon activation
 - b. Up-regulating expression of MHC II molecules upon activation
 - c. Interacting with the complement system
 - d. Acting as an antigen presenting cell V. inactivating viruses once they enter the macrophage
 - e. Decreasing enzymatic production
 - f. Increasing enzymatic production
 - i. A, C, D, E
 - ii. D, E, F
 - iii. B, C, D, F
 - iv. B, C, D, E
 - v. A, B, D, E
13. When a macrophage and microbe are at war, which statement is true? 1 pt.
- a. The macrophage digests the E. coli through the oxidative burst
 - b. The e. coli protects itself through the oxidative burst
 - c. The oxidative burst is characterized by an increased production of hydrogen peroxide
 - d. A & B
 - e. A & C
14. As blood passes through a capillary bed, which of the following occurs? 1 pt.
- a. Osmotic pressure decreases and net pressure is constant
 - b. Osmotic pressure increases and net pressure is constant
 - c. Osmotic pressure is constant and net pressure decreases
 - d. Osmotic pressure is constant and net pressure increases
 - e. Both osmotic and net pressure are constant

STATION 3

Please use the corresponding letter for the correct answer on the scantron sheet.

15. Which of the following cells are phagocytic? (Choose all that apply) 1 pt.
- a. Megakaryocyte
 - b. Dendritic cells
 - c. Natural killer cells
 - d. Neutrophils
 - e. Monocytes
16. Which of the following has the greatest total cross-sectional area in the human body? 1 pt.
- a. Arteries
 - b. Arterioles
 - c. Capillaries
 - d. Venules
 - e. Veins

STATION 4

Please use the corresponding letter for the correct answer on the scantron sheet.

17. During the cardiac cycle, (circle all that apply) 1 pt.
- The contraction of the atria forces atrioventricular valves to open and accounts for the majority of blood that fills the ventricles during ventricular filling
 - Papillary muscles open the atrioventricular valves to allow the passage of blood between chambers
 - At no time during the cardiac cycle are the mitral and aortic valves both open
 - The atria fill with blood during ventricular systole
 - The first (S1) and second (S2) heart sounds are due to the closing of the AV valve and the closing of the semilunar valves.
18. Why are there are two primary pulmonary arteries leaving the heart and four pulmonary veins returning to the heart? 1 pt.
- Pulmonary veins are the primary site of gas exchange
 - Rate of blood flow is directly proportional to vessel radius
 - Pulmonary venous valves inhibit venous return
 - Stenosis (occlusion) of the pulmonary veins is common
 - Pulmonary venous return must equal pulmonary arterial outflow
19. Myocardial infarction is the result of a blockage in: 1 pt.
- Superior Vena Cava
 - Inferior Vena Cava
 - Coronary Arteries
 - Aorta
 - Pulmonary Veins
20. Which of the following structures “sees” unoxygenated blood? 1 pt.
- Aorta
 - Left Ventricle
 - Pulmonary Artery
 - Pulmonary Veins
21. Chordae tendineae are not associated with this valve 1 pt.
- Aortic
 - Mitral
 - Tricuspid
 - Bicuspid

STATION 4

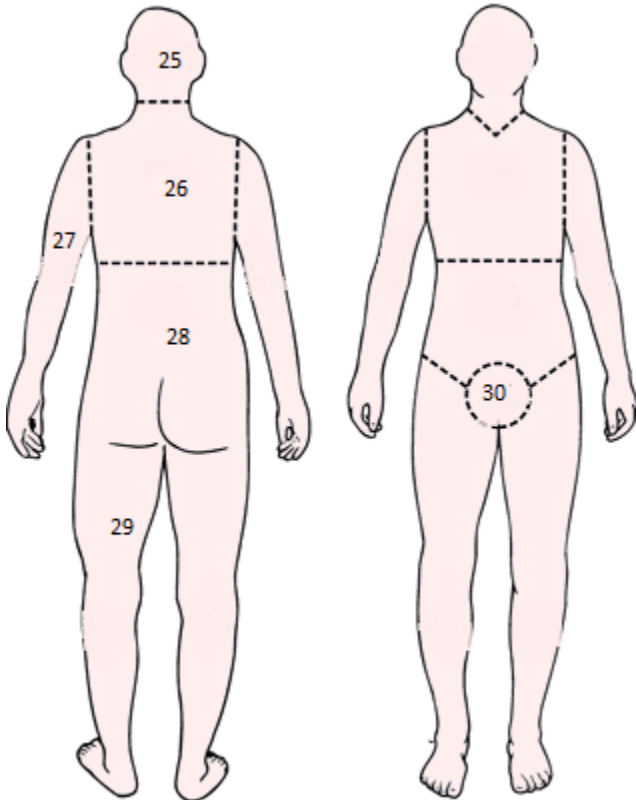
Please use the corresponding letter for the correct answer on the scantron sheet.

22. Where does the cardiac action potential (cardiac impulse) normally originate? 1 pt.
- a. AV node
 - b. Purkinje Fibers
 - c. Ectopic focus
 - d. SA node
23. Referring to the ECG, the P wave represents 1 pt.
- a. Atrial contraction
 - b. Ventricular relaxation
 - c. Atrial depolarization
 - d. Atrial repolarization
24. Which structure connects the cusps of the AV valves to the ventricles 1 pt.
- a. Purkinje fibers
 - b. AV node
 - c. Bundle of His
 - d. Chordae tendineae

STATION 5

Please use the corresponding letter for the correct answer on the scantron sheet.

25-30 Please indicate on the scantron the % for each body part listed using the Rule of Nine's burn chart. 1 pt. for each section



31. Each of the following is a function of the integumentary system except: 1 pt.

- a. maintenance of body temperature
- b. excretion of salts and wastes
- c. protection of underlying tissue
- d. provision of sensation
- e. synthesis of Vitamin C

32. The layer of the epidermis that contains abundant desmosomes in the 1 pt.

- a. stratum germinativum
- b. stratum corneum
- c. stratum granulosum
- d. stratum lucidum
- e. stratum spinosum

STATION 6

Please use the corresponding letter for the correct answer on the scantron sheet.

Using the skin model, please identify the following skin model numbers. 1 pt. each.

33. Model # 4

34. Model # 5

35. Model # 6

36. Model # 13

37. Model # 10

38. Model # 11

39. Model # 14

40. Model letter E

41. Model letter D

STATION 7

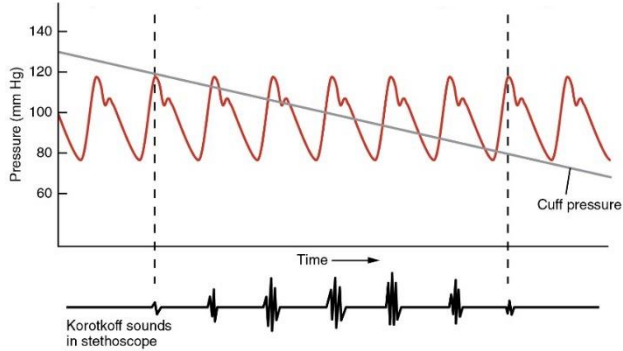
Please use the corresponding letter for the correct answer on the scantron sheet.

42. What is the blood pressure of your partner? 5 pts within 2 units, 4 pts. within 3 units, 3 pts. within 4 units, 2 pts. within 5 units, 1 pt. within 6-8 units. 0 points 9 and >

43. What is the resting pulse rate of your partner? 2 pts.

STATION 8

Please use the corresponding letter for the correct answer on the scantron sheet.



44. Using the graph above, please calculate the MAP (Include units). 2 pts.
45. Assuming your partner has a BP of 136/74, a HR of 85, Respirations of 16, O₂ sat of 99% and a stroke volume of 70, what is their cardiac output? 1 pt.
46. If a person is hypoxic (include all that apply) 1 pt.
- An increase in erythropoietin secretions into the blood stream will come primarily from the liver.
 - Increased erythropoietin levels in the blood stream will lead to proerythroblasts maturing more quickly into reticulocytes
 - An increase in erythropoietin secretions into the blood stream will come primarily from the kidneys
 - hemoglobin may release Nitric Oxide
 - The hemoatocrit will decrease in relation to a fluctuation in blood erythropoietin levels
47. Which of the following initiates blood clotting? 1 pt.
- Mechanical or chemical damage to blood vessel endothelium
 - Lymphocyte response to pathogen
 - Conversion of fibrinogen to fibrin
 - Hemophilia factor XIII
 - Release of clotting factor 1

STATION 9

Please use the corresponding letter for the correct answer on the scantron sheet.

Match the answer choices to the following cells. Place your answer on the scantron by the appropriate number
One point for each correct in 48-54

48. Macrophage

49. Dendritic cell

50. B cell

51. Cytotoxic T cell

52. Helper T cell

53. Neutrophil

54. Basophil

- a. Antigen-presenting cell
- b. Differentiates into memory cells
- c. Displays the CD4 surface protein
- d. Secretes Tumor Necrosis Factor
- e. Secretes perforin
- f. Secretes granzymes
- g. Secretes granulysin
- h. Produces α -interferon and β -interferon
- i. Produces interleukin-4
- j. Releases macrophage migration inhibiting factor
- k. Granular leukocyte
- l. Releases an oxidative burst
- m. High count in blood may indicate allergic reaction

Label the centrifuged blood sample. (TB1)

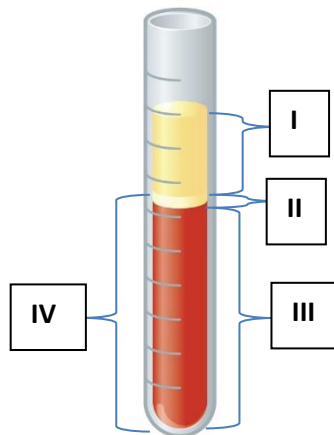
2 points for each correct label

55. Label picture # I

56. Label picture # II

57. Label picture # III

58. Label picture # IV



STATION 10

Please use the corresponding letter for the correct answer on the scantron sheet.

59. Identify the disease of the picture to the right. (1 pt.)



60. Identify the disease of the picture to the right (1 pt.)



61. Identify the disease of the picture to the right (1 pt.)



STATION 10

Please use the corresponding letter for the correct answer on the scantron sheet.

Answer the following questions based on the picture.

62. What kind of burn does this patient have? (1 pt)
63. Estimate the percentage of surface area affected by the burn. (1 pt)
64. What is one major systemic effect of a burn such as the one shown. (1 pt)



65. Which of the following is true of transplant rejection (include all that apply) (1 pt)
- a. Hypoacute rejection occurs > 1.5 hours after transplant
 - b. Acute rejection occurs anywhere from 1 week to 3 months after transplant
 - c. Hyperacute rejection occurs within a few minutes after transplant
 - d. Chronic rejection takes place within the first year after transplant
 - e. Chronic rejection takes place over many years
 - f. Acute rejection occurs within 3-6 months
66. The most common patient of Graves Disease is: (1 pt)
- a. Men from 30-40
 - b. Men from 40-50
 - c. Women from 30-40
 - d. Women from 40-50
67. Treatment of Graves Disease is to: (1 pt)
- a. Treat symptoms only
 - b. Reverse immune response causing the disease
 - c. Inhibit over production of thyroid hormones
 - d. Inhibit over production of pituitary hormones

**2015 NATIONAL SCIENCE OLYMPIAD
ANATOMY/PHYSIOLOGY C ANSWER KEY**

| | | | |
|-----------|-------------------------------------|--|--------|
| 1 B | 24 D | 43 "PULSE" | 65 BCE |
| 2 D | 25 4.50% | 44 93 MMHg | 66 C |
| 3 C | 26 9% | 45 5950 | 67 C |
| 4 B | 27 4.50% | 46 BCD | |
| 5 D | 28 9% | 47 A | |
| 6 C | 29 9% | 48 ADHL | |
| 7 D | 30 1% | 49 AL | |
| 8 C | 31 E | 50 AB | |
| 9 B | 32 E | 51 BEFGJ | |
| 10 EACBFD | 33 STRATUM LUCIDUM | 52 BCDL | |
| 11 B | 34 STRATUM CORNEUM | 53 KL | |
| 12 iii | 35 PORE OF SWEAT GLAND | 54 KM | |
| 13 E | 36 TACTILE CORPUSCLE (MEISSNERS) | 55 PLASMA | |
| 14 C | 37 ARRECTOR MUSCLE OF HAIR | 56 BUFFY COAT | |
| 15 BDE | 38 SEBACEOUS GLAND | 57 RBC | |
| 16 C | 39 LAMELLAR CORPUSCLE (PACINIAN) | 58 FORMED ELEMENTS | |
| 17 CDE | 40 HAIR CUTICLE | 59 SCABIES | |
| 18 E | 41 INTERNAL ROOT SHEATH | 60 HPV | |
| 19 D | 42 "BP" | 61 IMPETIGO | |
| 20 C | | 62 2° | |
| 21 A | | 63 6-9% | |
| 22 D | | 64 FLUID LOSS IMPAIRED TEMPERATURE CONTROL SUSC TO INFECTION | |



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