

Science Olympiad: Anatomy and Physiology 2014-2015

- 1) The tricuspid valve is located:
 - a) between the right atrium and right ventricle.
 - b) between the left atrium and aorta.
 - c) between the left atrium and aorta.
 - d) between the left atrium and left ventricle.
- 2) The first heart sound (S1) is caused by closure of the AV valves and the second heart sound (S2) is caused by closure of the SL valves.
 - a) True
 - b) False
- 3) The two valves located on the right side of the heart are the:
 - a) mitral valve and pulmonary valve.
 - b) aortic valve and mitral valve.
 - c) tricuspid valve and pulmonary valve.
 - d) aortic valve and pulmonary valve.
- 4) Oxygenated blood flows from the pulmonary circulation into the right atrium via the pulmonary veins.
 - a) True
 - b) False
- 5) The mitral valve is closed during:
 - a) ventricular diastole.
 - b) ventricular systole.
 - c) both ventricular systole and diastole.
 - d) neither ventricular systole or diastole.
- 6) Blood returns to the heart from the systemic circulation through which blood vessels?
 - a) aorta, coronary sinus, pulmonary veins
 - b) inferior vena cava, superior vena cava, aorta
 - c) inferior vena cava, superior vena cava, coronary sinus
 - d) pulmonary veins, inferior vena cava, superior vena cava
- 7) Tachycardia and bradycardia are respectively defined as heart rate greater than _____ beats per minute (bpm) and heart rate less than _____ bpm.
 - a) 80 . . . 60
 - b) 100 . . . 60
 - c) 120 . . . 50
 - d) 100 . . . 50
- 8) Choose the answer that correctly depicts the order of impulse conduction in the cardiac conduction system.
 - a) SA node > AV node > AV bundle > left and right bundle branches > Purkinje fibers
 - b) AV node > AV bundle > SA node > Purkinje fibers > left and right bundle branches
 - c) SA node > AV bundle > AV node > left and right bundle branches > Purkinje fibers
 - d) SA node > AV bundle > AV node > Purkinje fibers > left and right bundle branches
- 9) The AV node is considered the heart's pacemaker.
 - a) True

b) False

10) On an electrocardiogram the QRS complex results from _____ and the P wave results from _____.

- a) atrial depolarization . . . ventricular depolarization
- b) ventricular depolarization . . . atrial repolarization
- c) ventricular depolarization . . . atrial depolarization
- d) ventricular depolarization . . . ventricular repolarization

11) Which of the following factors can increase cardiac output?

- a) Increasing heart rate, increasing the contractility of the heart (i.e., increasing the forcefulness of contraction), increasing end diastolic volume
- b) decreasing heart rate, decreasing end diastolic volume, decreasing contractility of the heart
- c) increasing stroke volume, decreasing heart rate, decreasing contractility of the heart

Heart Case Study (Ventricular Septal Defect)

Marie and her newborn daughter Isabelle were discharged from the hospital approximately 5 weeks ago. Marie has noticed that Isabelle is not eating well. Isabelle never seemed to latch well during breast feeding. Two weeks ago Marie switched to bottle feeding with formula. Marie still feels that Isabelle is feeding poorly even after switching to bottle feeding. Isabelle does not feed for very long, and drinks only about 1 ounce at a time. Marie notices that Isabelle seems to breathe heavily all the time, but that her breathing gets even worse after feeding. Marie decides to see a nurse practitioner (NP) in order to discuss her concerns about Isabelle's difficulty feeding and breathing.

After listening to Marie's concerns, the NP weighs Isabelle and performs a physical exam. When the NP auscultates Isabelle's chest, she hears a murmur. The NP is concerned both by the murmur, and because Isabelle has not gained much weight since birth. The NP decides to order an ECG and an echocardiogram to evaluate Isabelle's heart. The ECG will show Isabelle's heart rate and rhythm. The echocardiogram (ultrasound of the heart) will provide a picture of Isabelle's heart structure, and show how blood flows through Isabelle's heart. For some of the case study questions you should imagine that blood in the heart is color-coded according to its oxygenation status (oxygenated blood is red, deoxygenated blood is blue).

The echocardiogram reveal that Isabelle's murmur is caused by something called a ventricular septal defect (VSD). A VSD is a hole in the interventricular septum, the wall of muscle that separates the left ventricle from the right ventricle. The ECG shows sinus rhythm with no conduction abnormalities.

12) Think about the position of the heart in the chest cavity. Isabelle's VSD is in the interventricular septum between the mitral and tricuspid valves. At what anatomical location would the NP best hear Isabelle's murmur?

- a) Between the right lower sternal border and the left lower sternal border
- b) Between the right upper sternal border and the left upper sternal border
- c) At the second intercostal space at the left upper sternal border
- d) At the fifth intercostal space at the left midclavicular line

- 13) Choose the answer that correctly depicts the order of blood flow through a normal heart and major blood vessels:
- a) Right atrium > right ventricle > pulmonary trunk > pulmonary veins > left atrium > left ventricle > aorta
 - b) Pulmonary trunk > pulmonary veins > right atrium > right ventricle > left atrium > left ventricle > aorta
 - c) Right atrium > right ventricle > pulmonary veins > pulmonary trunk > left atrium > left ventricle > aorta
 - d) Right ventricle > right atrium > pulmonary trunk > pulmonary veins > left ventricle > left atrium > aorta
- 14) In what, if any, manner would you expect a VSD to alter the flow of blood through Isabelle's heart?
- a) I would expect that some blood would flow from the left ventricle to the right ventricle during systole due to higher pressure in the left ventricle during systole.
 - b) I would expect that some blood would passively flow from the right ventricle to the left ventricle during diastole due to lower pressure in the left ventricle during diastole.
 - c) I would not expect a VSD to change the direction of blood flow through the heart.
- 15) In the heart of a person without a VSD, blood in the right ventricle would be _____, and blood in the left ventricle would be _____.
- a) oxygenated....oxygenated
 - b) deoxygenated....oxygenated
 - c) oxygenated....deoxygenated
 - d) deoxygenated....deoxygenated
- 16) Remember to imagine that blood in the heart is color-coded according to its oxygenation status (oxygenated blood is red, and deoxygenated blood is blue). What color of blood would you expect to see in Isabelle's left ventricle? ;)
- a) Blue
 - b) Red
 - c) Both red and blue
- 17) Remember to imagine that blood in the heart is color-coded according to its oxygenation status (oxygenated blood is red, deoxygenated blood is blue). What color of blood would you expect to see in Isabelle's right ventricle?
- a) Red
 - b) Both red and blue
 - c) Blue
- 18) Cardiac output is the volume of blood pumped by each ventricle per minute. The cardiac output is the product of:
- a) Stroke volume and end systolic volume
 - b) End diastolic volume and heart rate
 - c) End diastolic volume and end systolic volume
 - d) Stroke volume and heart rate
- 19) How would you expect the VSD to effect Isabelle's cardiac output?
- a) Cardiac output would not change.
 - b) Cardiac output would decrease because heart rate would decrease.

- c) Cardiac output would decrease because stroke volume would decrease.
 - d) Cardiac output would increase because stroke volume would increase.
- 20) Which of the following is NOT a function of skin?
- a) helps regulate body temperature
 - b) protects internal organs
 - c) contracts and relaxes muscles
 - d) helps prevent infection
- 21) Which of the following is NOT part of the integumentary system?
- a) skin
 - b) cartilage
 - c) nails
 - d) hair
- 22) Which of the following produce keratin?
- a) epidermal cells
 - b) sweat glands
 - c) adipose tissue cells
 - d) hair follicles
- 23) What are the two layers of the skin?
- a) keratin and dermis
 - b) epidermis and melanin
 - c) epidermis and dermis
 - d) melanin and keratin
- 24) The epidermis is made up mostly of
- a) flat, dead cells.
 - b) melanin.
 - c) collagen.
 - d) healthy, living cells.
- 25) Which of the following is a protein that makes up hair and nails?
- a) sweat
 - b) melanin
 - c) collagen
 - d) keratin
- 26) The most important function of the skin is
- a) separating the body from its environment.
 - b) storing fat.
 - c) sweating.
 - d) tanning.
- 27) Concerning skin color, which of the following statements is NOT correctly matched?
- a) skin appears yellow - carotene present
 - b) skin tans - increased melanin production.
 - c) no skin pigmentation (albinism) - genetic disorder
 - d) skin appears blue (cyanosis) - oxygenated blood
- 28) The function of melanin in the skin is

- a) lubrication of the skin.
 - b) protection from ultraviolet light.
 - c) prevention of skin infections.
 - d) to help regulate body temperature.
- 29) All of the following are considered effects of aging on the integumentary system EXCEPT:
- a) blood flow to the skin decreases.
 - b) the number of functioning melanocytes is decreased and those remaining localize in the hands and the face.
 - c) sebaceous and sweat glands increase in the amount secretion
 - d) White or gray hairs occur because of a decrease in melanin.
- 30) A fungal infection that affects the keratinized portion of the skin is called
- a) acne.
 - b) ringworm or athlete's foot.
 - c) decubitus ulcers.
 - d) warts.
- 31) _____ is a viral infection of the epidermis.
- a) A wart
 - b) Ringworm and athlete's foot
 - c) Acne
 - d) Impetigo
- 32) _____ is caused by bacteria and is characterized by a blistery rash on the skin.
- a) A decubitus ulcer
 - b) Psoriasis
 - c) Impetigo
 - d) Eczema
- 33) The germ theory of disease states that infectious diseases are caused by
- a) toxins.
 - b) pathogens.
 - c) heredity.
 - d) materials in the environment.
- 34) Which of the following is a way that an infectious disease might be transmitted?
- a) through inhalation or physical contact
 - b) through contaminated water and food
 - c) by infected animals
 - d) all of the above
- 35) The body's nonspecific defenses against invading pathogens include
- a) antibiotics.
 - b) mucus, sweat, and tears.
 - c) antibodies.
 - d) T cells.
- 36) The inflammatory response can cause
- a) permanent immunity.
 - b) pain, swelling, and redness.

- c) antibodies to bind to antigens.
 - d) T cells to attack infected cells.
- 37) An immune response is triggered by a(an)
- a) antibiotic.
 - b) antibody.
 - c) antigen.
 - d) histamine.
- 38) Which of the following regions would be found in a light chain?
- a) IgM
 - b) IgK
 - c) IgH
 - d) IgG
- 39) Humoral immunity originates from
- a) T cells.
 - b) NK cells.
 - c) B cells.
 - d) macrophages.
- 40) If a person has memory B cells against a certain pathogen, the person is
- a) likely to develop that disease.
 - b) not likely to develop the disease a second time.
 - c) able to spread the disease to others through physical contact.
 - d) probably still sick with the disease.
- 41) When a person receives a vaccine, his or her body
- a) receives antibodies against a specific pathogen.
 - b) produces memory cells that provide resistance to that pathogen.
 - c) produces antigens to fight the specific pathogen.
 - d) immediately begins fighting the infection caused by the pathogens.
- 42) Unlike passive immunity, in active immunity antibodies are produced by
- a) the mother of an infant.
 - b) your own body.
 - c) other animals.
 - d) an autoimmune disease.
- 43) What happens when a person who is allergic to ragweed encounters ragweed?
- a) Ragweed antigens bind to mast cells, which release histamine.
 - b) Ragweed antibodies attack the immune system.
 - c) Mast cells release antihistamines into the bloodstream.
 - d) The cells of the immune system become weakened.
- 44) Autoimmune diseases result when the immune system
- a) fails to distinguish self from non-self.
 - b) overreacts to certain antigens.
 - c) is weakened by vaccines.
 - d) all of the above
- 45) HIV weakens the immune system by killing mainly

- a) antibodies.
 - b) B cells.
 - c) helper T cells.
 - d) killer T cells.
- 46) An example of an autoimmune disease is
- a) AIDS.
 - b) allergies.
 - c) multiple sclerosis.
 - d) strep throat.
- 47) An infectious disease is one that is caused by
- a) heredity.
 - b) materials in the environment.
 - c) pathogens.
 - d) an organ transplant.
- 48) Which of the following is NOT a step in identifying the pathogen that causes a specific disease?
- a) The pathogen should be found in the body of a healthy organism.
 - b) The pathogen should be isolated and grown in a pure culture.
 - c) The purified pathogens should cause the same disease in a new host.
 - d) The pathogen should be isolated from the second host.
- 49) An example of an infectious disease that is caused by a virus is
- a) athlete's foot.
 - b) trichinosis.
 - c) the common cold.
 - d) Lyme disease.
- 50) Which of the following is an example of a disease-carrying organism and the disease it spreads?
- a) tall grass and Lyme disease
 - b) the deer tick and Lyme disease
 - c) the Nile river and West Nile disease
 - d) insecticides and malaria
- 51) A person who has received a vaccine against polio
- a) is able to produce antibodies against polio.
 - b) is more susceptible to the polio virus than someone who has not had the vaccine.
 - c) has polio antibodies in the bloodstream.
 - d) has antipolio killer T cells in the bloodstream.
- 52) The sneezing, runny nose and itchy eyes associated with allergies are caused when
- a) smooth muscles reduce the size of air passageways in the lungs.
 - b) the immune system attacks the body's own cells.
 - c) mast cells release histamine.
 - d) infected cells produce interferon.
- 53) The symptoms of the inflammatory response include
- a) runny nose and a cough.
 - b) redness, heat, swelling, and pain.
 - c) unusual infections of the lungs, mouth, throat, and skin.

d) formation of a vaccine.

54) The lymphatic system

- a) removes excess fluid from tissues.
- b) defends the body against microorganisms and other foreign substances.
- c) absorbs fats from the digestive system.
- d) all of the above

55) The tonsils

- a) consist primarily of diffuse lymphatic
- b) tissue.
- c) are located in the nasal cavity.
- d) consist of three groups. d. increase in size in adults.

56) Lymph nodes

- a) filter lymph.
- b) contain a network of reticular fibers.
- c) produce lymphocytes.
- d) all of the above.

57) Which of these is an example of innate immunity?

- a) Tears and saliva wash away microorganisms.
- b) Neutrophils phagocytize a microorganism.
- c) Basophils and mast cells release histamine and leukotrienes.
- d) All of the above

58) Macrophages

- a) are large phagocytic cells that outlive neutrophils.
- b) often die after a single phagocytic event.
- c) develop from mast cells.
- d) have the same function as eosinophils.

59) The thymus

- a) increases in size in adults.
- b) responds to foreign substances in the blood.
- c) produces lymphocytes that move to other lymphatic tissue.
- d) all of the above.

60) Variable amino acid sequences on the arms of the antibody molecule

- a) make the antibody specific for a given antigen.
- b) enable the antibody to attach to basophils and mast cells.
- c) enable the antibody to activate complement.
- d) all of the above.

61) Antibodies

- a) prevent antigens from binding together.
- b) inhibit inflammation.
- c) promote phagocytosis.
- d) block complement activation.

62) Rheumatoid arthritis

- a) results from wear and tear on a joint.

- b) c. causes inflammation of the bursae sacs only.
- c) is an autoimmune disease
- d) d. all of the above

ANSWER KEY:

- 1. A
- 2. A
- 3. C
- 4. B
- 5. B
- 6. C
- 7. B
- 8. A
- 9. B
- 10. C
- 11. A
- 12. A
- 13. A
- 14. A
- 15. B
- 16. B
- 17. B
- 18. D
- 19. C
- 20. C
- 21. B
- 22. D
- 23. C
- 24. A
- 25. D
- 26. A
- 27. D
- 28. C
- 29. B
- 30. C
- 31. A
- 32. C
- 33. B
- 34. D
- 35. B
- 36. B
- 37. C

- 38. B
- 39. C
- 40. B
- 41. B
- 42. B
- 43. A
- 44. A
- 45. C
- 46. C
- 47. A
- 48. C
- 49. B
- 50. A
- 51. C
- 52. B
- 53. D
- 54. B
- 55. D
- 56. D
- 57. A
- 58. B
- 59. A
- 60. B
- 61. A
- 62. A