

**BIOS 100, Cells and Organisms**  
**Exam IV, 5 December, 2007**  
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**Name:**

This exam consists of 54 painfully simple questions created with love and joyously displayed over the seven pages you have been given. Last exam I warned you that if you didn't bubble in your last name, I wouldn't give you the extra credit points you earned. Two people didn't listen, and they lost their points. Do not join them... everyone's asking for extra credit, and all you have to do to earn it is to follow directions. Isn't that easy?

1. The heart has been called "two pumps in one." The right side of the heart is involved in \_\_\_\_\_ circulation while the left side of the heart is involved in \_\_\_\_\_ circulation.  
**A. pulmonary; systemic**                      B. systemic; pulmonary
2. Which of the following statements (A-D) about the heart is FALSE? If statements A-D are true, then choose E.  
A. Systolic blood pressure measures pressure when the ventricles contract while diastolic blood pressure measures pressure when the ventricles relax  
B. The muscular walls of the ventricles are stronger and thicker because they must pump blood farther than the thinner walls of the atria.  
**C. Blood leaving the right ventricle is destined to the body**  
D. Valves are present in the heart to direct the flow of blood from one chamber to the next and prevent the back flow of blood  
E. All of the above statements are TRUE

Matching - use the key below to answer questions 3-8. Answers may be used once, more than once, or not at all

- A. Arteries    B. Arterioles                      C. Capillaries                      D. Venules    E. Veins

3. These blood vessels have the thinnest walls    **C**
4. The greatest drop in blood pressure occurs in these blood vessels    **B**
5. These blood vessels contain valves to prevent the backflow of blood    **E**
6. These blood vessels have the thickest and most elastic walls    **A**
7. Gas exchange typically occurs across the membranes of these blood vessels    **C**
8. Blood pressure is lowest in these blood vessels    **E**
9. Where is the partial pressure of O<sub>2</sub> the greatest?  
**A. The air we breathe**                      B. Capillary blood surrounding the alveoli  
C. The blood as it enters the left atrium    D. Capillary blood in body tissues  
E. The interstitial fluid
10. Where is the partial pressure of CO<sub>2</sub> the greatest?  
A. The air we breathe                      B. Capillary blood surrounding the alveoli  
C. The blood as it enters the left atrium    D. Capillary blood in body tissues  
**E. The interstitial fluid**

11. How is the majority of the CO<sub>2</sub> returned to the lungs
- A. Directly dissolved in the blood                      B. Bound to hemoglobin  
 C. As carbonic acid (H<sub>2</sub>CO<sub>3</sub>)                              D. **As bicarbonate (HCO<sub>3</sub><sup>-</sup>)**
12. Which of the following statements (A-C) about myoglobin is FALSE? If statements A-C are true, then choose D.
- A. Myoglobin is primarily located in the muscles  
 B. Myoglobin has a much higher affinity for O<sub>2</sub> than normal hemoglobin  
 C. Myoglobin will release O<sub>2</sub> when the muscles become oxygen starved  
 D. **All of the above statements about myoglobin are TRUE**
13. Which organ is incorrectly matched with its function?
- A. Small intestine - chemical digestion and absorption of nutrients  
 B. Large intestine - absorption of water and minerals  
 C. **Liver - production of the majority of digestive enzymes for the small intestine**  
 D. Gall bladder - storage of bile  
 E. Stomach - production of HCl to kill bacteria as well as mechanical and chemical digestion
14. Why does the small intestine possess such a great internal surface area?
- A. **To better facilitate absorption of nutrient absorption**  
 B. To minimize damage from the highly acidic stomach  
 C. To better facilitate the secretion of digestive enzymes  
 D. The finger-like villi help to move food through the small intestine  
 E. I'm just messin' with ya' - the small intestine doesn't possess a great internal surface area
15. What is the function of bile?
- A. To break down triglycerides into glycerol and fatty acids  
 B. **To emulsify large fat globules, creating small fat droplets**  
 C. To increase permeability of the intestinal walls to fats  
 D. To neutralize stomach acids  
 E. None of the above
16. What was Olestra?
- A. A naturally produced enzyme that breaks down fat  
 B. An artificially produced enzyme that breaks down fat  
 C. **An artificially produced fat substitute which caused many unpleasant side effects**  
 D. An artificially produced fat emulsifier  
 E. None of the above
17. Which organ has the greatest amount of vascularization?
- A. The mouth                                      B. The stomach                                      C. **The small intestine**  
 D. The large intestine                              E. The anus

18. What is the function of the  $\text{Na}^+/\text{K}^+$  pump in the epithelial cells lining the lumen of the proximal tubule?
- To pump excess  $\text{Na}^+$  from the filtrate into the luminal cells
  - To pump  $\text{Na}^+$  from the lumen epithelium cells into the filtrate to create a  $\text{Na}^+$  gradient
  - To pump  $\text{Na}^+$  from the lumen epithelium cells into the blood to create a  $\text{Na}^+$  gradient**
  - To pump  $\text{Na}^+$  from the blood vessels into the lumen epithelium cells
  - None of the above
19. Where is blood plasma filtered out of the blood?
- The glomerulus**
  - The proximal tubule
  - The distal tubule
  - The Loop of Henle
  - The Bowman's capsule
20. Which of the following statements (A-D) about nephron function is FALSE? If statements A-D are true, then choose E.
- The permeability of the walls of the ascending branch of the Loop of Henle and the collecting duct to water are affected by the hormone ADH (anti-diuretic hormone)**
  - Water leaves the filtrate by osmosis and enters the blood in the proximal tubule
  - Water leaves the filtrate by osmosis and eventually enters the blood in the descending branch of the Loop of Henle
  - Facilitated diffusion symports involving the transport of  $\text{Na}^+$  and another molecule are largely used to remove valuable nutrients, molecules, and ions from the filtrate
  - All of the above statements are TRUE
21. When  $\text{Na}^+$  levels of the blood are low, the body secretes \_\_\_\_\_ to increase  $\text{Na}^+$  absorption.
- ADH
  - aquaporins
  - aldosterone**
  - $\text{Na}^+/\text{K}^+$  pumps
  - None of the above
22. What is the function of podocytes?
- Podocytes increase the pressure in the glomerulus to help squeeze out blood plasma
  - Podocytes line the Bowman's capsule to help filter the filtrate
  - Podocytes line the glomerular capillaries and aid in filtration**
  - Podocytes secrete ADH
  - None of the above
23. The solute concentration of the interstitial fluid of the kidney medulla ranges from 300 mosm/L to 1200 mosm/L. What is the concentration of the filtrate in the hairpin turn of Loop of Henle?
- 300 mosm/L
  - 600 mosm/L
  - 900 mosm/L
  - 1200 mosm/L**
  - 1500 mom/L
24. What is the concentration of the filtrate when it leaves the Loop of Henle and enters the distal tubule?
- 300 mosm/L**
  - 600 mosm/L
  - 900 mosm/L
  - 1200 mosm/L
  - 1500 mom/L

25. Which of the following statements (A-D) about the endocrine system is FALSE? If statements A-D are true, then choose E.
- A. **The same hormone will have the same effect in all target cells**
  - B. Sometimes two or more hormones must bind to a cell to produce an effect
  - C. Endocrine hormones travel through the blood
  - D. Protein hormones usually have to bind to a receptor on the cell surface but steroid hormones pass directly into the cell and bind to a receptor in the cytoplasm
  - E. All of the above statements about the endocrine system are TRUE
26. What is a hormone antagonist?
- A. A molecule that mimics the effect of a hormone
  - B. **A molecule that binds to the hormone receptor site, impeding the hormone's ability to bind and generate an effect**
  - C. A molecule that binds to another receptor on the cell and impedes the hormone's ability to bind and generate an effect
  - D. A molecule that can stop production of a hormone
  - E. A molecule that binds directly to the hormone, impeding the hormone's ability to bind and generate an effect
27. The transfer of neurotransmitters between adjacent neurons is an example of:
- A. Autocrine action
  - B. **Paracrine action**
  - C. Endocrine action
28. This portion of the autonomic nervous system is best characterized by "rest and digest."
- A. Sympathetic nervous system
  - B. **Parasympathetic nervous system**
29. What is the function of a Schwann cell?
- A. Creation of neurotransmitters
  - B. Reuptake of neurotransmitters
  - C. Maintenance of membrane polarity
  - D. **Serve as an insulator for the axon**
  - E. Aid in cell reproduction
30. Which of the following statements (A-D) about action potentials is FALSE? If statements A-D are true, then choose E.
- A. An action potential is all or nothing
  - B. A nerve at rest has a negative polarity inside relative to the outside. During an action potential,  $\text{Na}^+$  channels open up to allow  $\text{Na}^+$  to rush in, temporarily making a region of the neuron positive relative to the outside.
  - C. **The opening of  $\text{Na}^+$  channels also triggers the opening of  $\text{K}^+$  channels, allowing  $\text{K}^+$  to flow into the neuron, making it yet more positive relative to the outside**
  - D. After an action potential, there is a refractory period, during which the neuron cannot fire again
  - E. All of the above statements about action potentials are TRUE
31. At a synapse, the sudden influx of ions causes vesicles full of neurotransmitters to be released into the synaptic cleft. These neurotransmitters bind to receptors on the post-synaptic terminal, causing gated sodium channels to open in the post-synaptic neuron
- A. **True**
  - B. False

32. What is the primary function of the cerebellum?
- A. It is the site of higher thought and consciousness
  - B. It regulates sensory input
  - C. It regulates heart rate and breathing
  - D. It coordinates movement**
  - E. None of the above
33. Sensory input (except olfaction) passes through the \_\_\_\_\_ in the forebrain
- A. Frontal lobe
  - B. Thalamus**
  - C. Hypothalamus
  - D. Corpus callosum
  - E. Parietal lobe
34. What part of the brain serves as the body's homeostatic regulator?
- A. Frontal lobe
  - B. Thalamus
  - C. Hypothalamus**
  - D. Central sulcus
  - E. Parietal lobe
35. What portion of the hindbrain functions in synthesizing sensory input?
- A. Medulla oblongata
  - B. Pons**
  - C. Cerebellum
36. What portion of the forebrain is responsible for integration of hearing?
- A. Frontal lobe
  - B. Parietal Lobe
  - C. Temporal lobe**
  - D. Occipital lobe
37. The \_\_\_\_\_ connects the left and right hemispheres of the cerebrum
- A. Central sulcus
  - B. Thalamus
  - C. Hypothalamus
  - D. Corpus callosum**
  - E. Parietal lobe
38. Which part of the body would have the smallest area of the primary motor cortex devoted to its regulation?
- A. Lips
  - B. Index Finger
  - C. Thumb
  - D. Big Toe**
  - E. Eyes
39. Which of the following statements about the skin is FALSE?
- A. The skin is the most effective barrier to pathogens, blocking body entry of well over 99% of encountered pathogens
  - B. Healthy skin is very moist and contains secreted enzymes which break down bacterial cell walls**
  - C. The skin has a low pH
  - D. The skin contains colonies of harmless bacteria growing upon it
  - E. Areas of the skin and mucous membranes contain cilia which help filter particulate matter and prevent pathogen entry into the body
40. What is the function of a mast cell?
- A. They secrete chemicals that alter blood flow near a wound**
  - B. They are phagocytic, so they engulf pathogens and kill them
  - C. They can become antigen-presenting cells
  - D. They destroy parasitic worms
  - E. They secrete complementary proteins

41. What type of cell can become an antigen-presenting cell (APC)?  
**A. Macrophage**                      B. Mast Cell                      C. Neutrophil  
 D. Eosinophil                      E. Helper T Cell
42. To activate a memory or virgin Cytotoxic T Cell, it must receive activation from:  
 A. An antigen presenting cell                      B. An Effector Helper T Cell  
 C. Direct contact with a pathogen                      **D. A & B**  
 E. A & C
43. To activate a memory or virgin B Cell, it must receive activation from:  
 A. An antigen presenting cell                      B. An Effector Helper T Cell  
 C. Direct contact with a pathogen                      D. A & B  
**E. B & C**
44. Which of the following statements about inflammation is FALSE?  
 A. Inflammation causes localized redness, swelling, heat, and pain  
 B. Inflammation promotes macrophage activity  
**C. Inflammation causes the capillary walls to become tight, preventing bacterial access to the bloodstream**  
 D. Inflammation causes macrophages to release cytokines which promote drowsiness  
 E. Mast cells secrete chemicals to increase blood flow near the wound but reduce blood flow right at the wound.
45. Which cell type is incorrectly matched with its function?  
 A. B Cells - produce antibodies  
 B. Macrophages - engulf and kill pathogens  
 C. Helper T Cells - produce and secrete chemicals which activate virgin or memory Cytotoxic T and B Cells, creating large numbers of effector and memory cells  
 D. Cytotoxic T Cells - T lymphocytes that eliminate infected body cells and tumor cells  
**E. All of the above are correctly matched with their function**
46. Place the following sequence in order to best describe a cell-mediated immune response:  
 I. Activated Helper T-cells secrete chemicals to further activate memory or virgin Cytotoxic T-cells  
 II. The pathogen is consumed by a macrophage  
 III. Effector Cytotoxic T-cells hunt and destroy the pathogen  
 IV. The macrophage forms an antigen-MHC complex , becoming an antigen-presenting cell  
 V. The body is invaded by a pathogen  
 VI. The virgin or memory Helper T-cells and Cytotoxic T-cells with complementary receptors become activated by binding to the antigen-MHC complex of the antigen-presenting cell
- A. I, II, III, IV, V, VI                      **B. V, II, IV, VI, I, III**  
 C. V, II, VI, IV, I, III                      D. V, IV, VI, II, I, III

47. Your immune response time typically is slow when you are first invaded by a pathogen. However, if you are later invaded by the same pathogen, your immune response time is much faster. This is due to the presence of:
- A. Antibodies in the bloodstream
  - B. Increased macrophage numbers
  - C. Increased pathogen sensitivity in the macrophages and neutrophils
  - D. Memory populations of Helper T, Cytotoxic T, and B Cells**
48. What observation enabled to Edward Jenner to experiment and develop a vaccination for smallpox?
- A. People who got smallpox frequently died, but if they didn't die the first time, they usually died if they were exposed to small pox a second time
  - B. Survivors of smallpox were frequently immune to further exposures to small pox
  - C. Survivors of cowpox were then frequently immune to small pox**
  - D. Sarah the milkmaid was immune to cowpox
  - E. Blossom the cow possessed a strain of smallpox that was very weak
49. A cell invaded by a virus will possess different antigens, so it may be targeted by your body's immune system
- A. True**
  - B. False
50. These are responsible for the ABO blood system we discussed earlier in class.
- A. Antigens found on blood cells**
  - B. Antigens found on Helper T Cells
  - C. Antibodies floating in the blood
  - D. Antigens recognized by Cytotoxic T Cells
51. Which of the following is the correct pathway that blood takes through the heart to oxygenate blood?
- A. Vena cava - Right Atrium - Right Ventricle - Pulmonary Vein - Lungs - Pulmonary Artery - Left Atrium - Left Ventricle - Aorta
  - B. Vena cava - Left Atrium - Left Ventricle - Pulmonary Vein - Lungs - Pulmonary Artery - Right Atrium - Right Ventricle - Aorta
  - C. Vena cava - Right Atrium - Right Ventricle - Pulmonary Artery - Lungs - Pulmonary Vein - Left Atrium - Left Ventricle - Aorta**
  - D. Vena cava - Left Atrium - Left Ventricle - Pulmonary Artery - Lungs - Pulmonary Vein - Right Atrium - Right Ventricle - Aorta
  - E. None of the above
52. When you inhale, your diaphragm is:
- A. Relaxing
  - B. Contracting**
53. This organ secretes the hormone insulin, which regulates blood sugar
- A. Liver
  - B. Gall Bladder
  - C. Pancreas**
  - D. Pituitary gland
54. Aside from nasty, how would you describe the taste of kidney pie?
- A. Sweet
  - B. Sour
  - C. Salty**
  - D. Bitter