

Exam III: Take-Home Due Mon, 3/20/06
Physiology Winter 2006

Multiple Choice: Use a ScanTron, do NOT staple the Scan Tron to these questions. In fact, you don't even need to print them out and turn them in to me! Just the Scan tron and the short answer/essay.

1. If a person has a blood pressure of 120/80, the pressure that reflects the left ventricle in diastole is:
 - a. 120
 - b. 80
 - c. 100
 - d. none of the above

2. Blood pressure increases with all of the following, EXCEPT:
 - a. Increased vessel length
 - b. Increased blood volume
 - c. Increased turbulence
 - d. Decreased viscosity

3. What would happen if there were not a delay in impulse propagation at the AV node in the heart?
 - a. Oxygenated and deoxygenated blood would mix in the atria
 - b. Oxygenated and deoxygenated blood would mix in the ventricles
 - c. The ventricles would contract before the atria had "topped them off" with atrial contraction
 - d. A and C
 - e. All of the above

4. Which of the following events would I be most likely to observe in red marrow?
 - a. Lipogenesis (making triglycerides)
 - b. Erythropoiesis
 - c. Excretion of bilirubin through bile
 - d. Ventricular repolarization
 - e. Gluconeogenesis

5. How many O₂ can one hemoglobin carry?
 - a. 2
 - b. 4
 - c. 8
 - d. 16

6. A tissue has become very active; it's cells are making and using lots of ATP. Byproducts of the increased activity will cause local precapillary sphincters to _____. An example of one of those byproducts is _____.
- Constrict; O₂
 - Constrict; CO₂
 - Dilate; CO₂
 - Dilate; O₂
 - Dilate; clotting factors
7. Venous return is accomplished by:
- Muscles squishing veins and pushing blood "forward"
 - Pressure differentials between the thoracic and abdominal cavities "sucking" blood up as you breath
 - One way valves preventing back flow
 - A and C
 - All of the above
8. The pacemaker cells of the heart are located in the:
- Wall of the left ventricle
 - Purkinje fibers
 - AV node
 - SA node
9. The pacemaker cells of the heart would spontaneously depolarize at a rate of 80-100 times per minute if left to their own devices. The fact that the average heart rate is 75 beats/minute is because of the influence of _____ which transmits the neurotransmitter _____.
- Sympathetic division; NE
 - Parasympathetic division; Ach
 - Gap junctions; Ach
 - Sympathetic division; Ach
 - Parasympathetic division; NE
10. Which of the following would NOT be released in response to a drop in blood pressure:
- Renin/Angiotensin II
 - ADH
 - Atrial Natriuretic Peptide
 - NorEpinephrine
 - Erythropoietin

11. If a sympathetic fiber is releasing Ach onto the tunica media (smooth muscle) of a blood vessel, that vessel will _____ and it is most likely bringing blood to _____.
- Constrict; stomach
 - Constrict; skeletal muscle
 - Dilate; small intestine
 - Dilate; skeletal muscle
 - Dilate; stomach
12. The phenomenon that blood vessels are normally maintained in a partially constricted state, so that their diameter is between maximal and minimal, is referred to as:
- Isovolumetric contraction
 - Mean Arterial Pressure (MAP)
 - Blood Colloid Osmotic Pressure
 - Vasomotor tone
13. Blood pressure can be quickly (within minutes) adjusted using _____ which _____ resistance and _____ pressure:
- Increased turbulence; raises; raises
 - Vasodilation; raises; decreases
 - Increased blood cell production; decreases; raises
 - Vasoconstriction; raises; raises
 - None of the above
14. What do Epinephrine and Angiotensin II have in common regarding blood pressure control?
- Directly cause increased rates of red blood cell production
 - Directly cause vasodilation
 - Directly cause vasoconstriction
 - Directly increase blood volume/water retention at the kidneys
 - B and D
15. The enzyme _____ converts _____ to Angiotensin I:
- Renin; angiotensinogen
 - Renin; angiotensin I
 - Angiotensin Converting Enzyme; angiotensinogen
 - Angiotensin Converting Enzyme; angiotensin I
16. General vasodilation would be the direct result of:
- An increase in parasympathetic influence
 - An increase in sympathetic influence
 - Activation of angiotensin II
 - A decrease in sympathetic influence
 - Aldosterone release being blocked

17. The baroreceptors in the carotid and aortic sinuses are sensitive to:
- A decrease in carbon dioxide
 - Changes in arterial pressure
 - A decrease in oxygen
 - All of the above
18. The absorptive surfaces of the lining of the small intestine, which are extensions of individual enterocytes, are:
- Villi
 - Microvilli
 - Plicae
 - Rugae
19. Fat-soluble nutrients are absorbed via:
- Capillaries in the lamina propria of a villus
 - Lacteal in the lamina propria of a villus
 - Gastric pits
 - Common bile duct
20. Under the influence of ParaThyroid Hormone, the _____ would:
- PCT; secrete more Ca^{++}
 - Thin segment of the loop of Henle; reabsorb more water
 - DCT; reabsorb more Ca^{++}
 - Collecting ducts; reabsorb more Na^+
 - DCT; secrete more urea
21. Renin is released directly by _____ when _____.
- Juxtaglomerular cells; blood pressure increases
 - Macula densa; solute concentration increases
 - Juxtaglomerular cells; blood pressure declines
 - Sympathetic division of the ANS; there is an emergency
 - Principal cells; hypernatremia occurs
22. If the transport max for glucose is reached,
- No more glucose will be absorbed from the diet
 - Pyruvates are converted to lactic acid
 - Not all glucose will be reabsorbed and some will end up in urine
 - A and B
 - All of the above
23. How would Angiotensin Converting Enzyme (ACE) Inhibitors affect blood pressure?
- Prevent activation of Angiotensin I; decrease blood pressure
 - Prevent release of renin; increase blood pressure
 - Prevent activation of Angiotensin II; decrease blood pressure
 - Prevent release of Atrial Natriuretic Peptide; increase blood pressure

24. If NFP and GFR were too high,
- Reabsorption would not be affected
 - Not enough nutrients would be reabsorbed; filtration membrane could be damaged
 - Wastes would accumulate in the blood
 - None of the above
25. Which of the following would increase secretion of K^+ ?
- ADH
 - Aldosterone
 - High blood concentration of K^+
 - A and B
 - B and C
26. Around the loop of Henle, the interstitium is _____ to the filtrate because of the activity of the _____ segment.
- Hypotonic; thick
 - Hypertonic; thick
 - Hypotonic; thin
 - Hypertonic; thin
27. As the vasa recta begins to loop around the thick segment of the loop of Henle,
- Water leaves the blood and enters the filtrate
 - $NaCl$ leaves the blood
 - $NaCl$ enters the blood
 - The blood starts to become very dilute (less concentrate)
28. Most reabsorption of substances from nephrons occurs in the _____. The _____ is designed to help maximize water reabsorption:
- DCT; PCT
 - DCT; collecting ducts
 - PCT; loop of Henle
 - Loop of Henle; DCT
 - Collecting ducts; loop of Henle
29. Which of the following could dramatically decrease NFP and GFR?
- Atrial Natriuretic Peptide
 - Angiotensin II
 - Sympathetic stimulation
 - Parasympathetic stimulation
 - A and D

30. Under the influence of ADH, cells of the renal collecting ducts would:
- Insert more water channels in their membranes
 - Allow more water to be reabsorbed
 - Increase secretion of H^+
 - A and B
 - B and C
31. Which of the following is not a major electrolyte of the IntraCellular Fluid?
- Na^+
 - K^+
 - Proteins
 - Phosphate
32. Swelling of cells and appearing intoxicated are symptoms of:
- Hyperkalemia
 - Hypocalcemia
 - Hyponatremia
 - Hypernatremia
 - Hypercalcemia
33. Neuromuscular problems and calcification of soft tissues are symptoms of:
- Hyperkalemia
 - Hypercalcemia
 - Hypokalemia
 - Hypocalcemia
34. If blood pH drops, normally you will _____ respiratory rate to rid excess _____.
- Increase; H_2O
 - Increase; CO_2
 - Increase; O_2
 - Decrease; H_2O
 - Decrease; CO_2
35. H^+ are rid in the lungs because:
- They are dissolved in water vapor as you breathe out
 - They remain in the blood bound to buffers
 - They are locked up in water as CO_2 is expelled
 - None of the above
36. Hypoventilation could lead to:
- Acidosis
 - Alkalosis
 - Hypernatremia
 - Hypocalcemia

37. Which of the following conditions could potentially be the result of chronically high levels of aldosterone?
- Glycosuria
 - Hyponatremia
 - Hypokalemia
 - Hypercalcemia
 - Overhydration
38. Which of the following does NOT occur during spermiogenesis:
- Excess cytoplasm is shed
 - Microtubules form a flagellum
 - Proteolytic (digestive) enzymes are bundled in an acrosomal cap
 - The nucleus condenses
 - None of the above (all occur)
39. How many times is meiosis suspended in an oocyte before it is fertilized?
- 1
 - 2
 - 3
 - 4
40. Ovulation corresponds with the beginning of:
- Menses
 - Secretory phase
 - Proliferative phase
 - Follicular stage
41. During filtration, which of the following would not be filtered from the blood into the capsular space off a Bowman's capsule in a healthy kidney?
- Glucose
 - Na⁺
 - Albumin (a blood protein)
 - Amino acids
42. To get from the lumen of the glomerulus into the lumen of Bowman's capsule, plasma will have to pass through:
- Filtration slits between pedicels
 - Fenestrations of the endothelium plus a basal lamina
 - Respiratory membrane
 - A and B
 - All of the above

43. The area where the DCT runs between the afferent and efferent arterioles is called the _____. Specialized smooth muscle cells that act as baroreceptors in this area are called _____.
- Macula densa; juxtaglomerular cells
 - Juxtaglomerular apparatus; macula densa cells
 - Filtration membrane; juxtaglomerular cells
 - Juxtaglomerular apparatus; juxtaglomerular cells
 - What the heck are you talking about?
44. Progesterone is secreted by:
- Follicle cells
 - Sustentacular cells
 - Uterine glands
 - Corpus luteum
45. Spermatogenesis occurs in the
- Seminiferous tubules
 - Epididymis
 - Ductus deferens
 - Seminal vesicles
 - Corpora cavernosa
46. When FSH levels increase in a female,
- Follicle cells grow around a developing oocyte
 - Estrogens are secreted by follicle cells
 - A corpus luteum is formed
 - A and B
 - B and C
47. Maltase and peptidases are located:
- In the stomach
 - In saliva
 - At the brush border
 - In gastric pits
48. When cells of a gastric pit are active, why does the local blood supply become slightly more basic?
- HCO_3^- is sent to the blood
 - H^+ is sent to the blood
 - Cl^- is sent to the blood
 - None of the above

49. The enzymatic breakdown of large molecules into their basic building blocks is a type of:
- Absorption
 - Secretion
 - Mechanical digestion
 - Chemical digestion
50. Double sheets of peritoneum which provide routes for vessels and hold digestive organs in place are called:
- Visceral peritonea
 - Mesenteries
 - Abdominopelvic cavities
 - Lacteals
51. Amylase is secreted by:
- Salivary glands; parietal cells
 - Parietal cells, chief cells
 - Parietal cells pancreatic exocrine cells
 - Salivary glands, pancreatic exocrine cells
 - Salivary glands, parietal cells, pancreatic exocrine glands
52. HCl is secreted by _____ cells, which also secrete _____.
- Chief; pepsin
 - Parietal; intrinsic factor
 - Acinar; insulin
 - Acinar; intrinsic factor
 - Kupfer; metals
53. Polar bodies are:
- Cells that support sperm development
 - Non-viable cells produced during certain stages of oogenesis
 - Viable oocytes
 - Really cold
54. Which of the following is NOT a function of sustentacular cells?
- Stimulate spermatogenesis and spermiogenesis
 - Maintain a blood-testis barrier
 - Absorb sloughed cytoplasm from developing spermatocytes
 - Secrete testosterone
55. In order to produce HCl, cells of a gastric pit would utilize the enzyme _____.
- Amylase
 - Trypsin
 - Sucrase
 - Carboxypeptidase
 - Carbonic anhydrase

56. Surface area of the small intestinal wall is maximized by:
- Plicae
 - Villi
 - Microvilli
 - A and C
 - All of the above
57. Which of the following is NOT a function of hepatocytes?
- Make bile
 - Detoxify substances
 - Secrete trypsinogen
 - Gluconeogenesis
 - Store glycogen
58. Fats would not be efficiently digested and absorbed if bile were not present because:
- Bile salts hydrolyze triglycerides into fatty acids and monoglycerides, which can be absorbed
 - Bile salts increase the surface area of fat blobs available to lipases
 - Bile salts increase the permeability of lacteals
 - A and B
 - A and C
59. When LH levels increase in a female,
- Follicle cells grow around a developing oocyte
 - Estrogens are secreted by follicle cells
 - A corpus luteum is formed
 - A and B
 - B and C
60. Pepsinogen is released by:
- Parietal cells
 - Chief cells
 - G cells
 - Enterocytes
61. Water reabsorption is the primary role of the _____:
- Stomach
 - Small intestine
 - Respiratory membrane
 - Large intestine
 - Spleen

62. Which of the following is NOT a way that CO₂ is transported to the lungs from tissues (through blood):
- Dissolved CO₂
 - Carbaminohemoglobin (bound to Hb)
 - HCO₃⁻
 - Bound to Cl⁻
63. Why does an increase in blood CO₂ trigger respiratory centers of the medulla to increase breathing rate and depth?
- CO₂ binds directly to receptors in the medulla
 - CO₂ diffuses into the CSF, is converted to H₂CO₃, which then dissociates into HCO₃⁻ and H⁺
 - H⁺ binds to receptors of the medulla
 - B and C
 - None of the above
64. When receptors in the _____ detect very low concentrations of O₂ in the blood, they will cause an _____ in breathing rate and depth
- Aortic & carotid bodies; decrease
 - Pons; decrease
 - Aortic and carotid bodies; increase
 - Hypothalamus; increase
65. Intrapleural pressure is maintained _____ intrapulmonary pressure:
- Above
 - Below
 - Equal to
66. The amount of air that can be forcibly evacuated after a normal expiration is called:
- Tidal volume
 - Inspiratory reserve volume
 - Residual volume
 - Expiratory reserve volume
67. Restful **inspiration** is _____ and involves the diaphragm and _____ muscles:
- Passive; external oblique
 - Active; external oblique
 - Passive; external intercostals
 - Active; external intercostals

68. Following is a list of events that are involved in CO₂ transport and exchange:
- i. CO₂ diffuses into a RBC
 - ii. CO₂ diffuses out of a RBC
 - iii. HCO₃⁻ leaves the RBC and enters the plasma
 - iv. Carbonic anhydrase combines H₂O and CO₂ to form H₂CO₃
 - v. HCO₃⁻ enters the RBC
 - vi. Carbonic anhydrase splits H₂CO₃ into H₂O and CO₂
 - vii. H⁺ binds to hemoglobin
 - viii. H⁺ is released from hemoglobin

Which of the following is the correct order of events in the capillaries of TISSUES (as opposed to lungs)?

- a. 1, 4, 7, 3
 - b. 5, 6, 2
 - c. 4, 5, 2, 3
 - d. 5, 4, 2, 6
69. The respiratory centers that set the basic breathing rhythm and control respiratory muscles directly is located in the _____. They in turn are controlled by respiratory centers in the _____.
- a. Medulla; medulla
 - b. Mesencephalon; pons
 - c. Hypothalamus; pons
 - d. Medulla; pons
 - e. Medulla; mesencephalon
70. In the lungs, carbonic anhydrase would drive the reaction:
- a. $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$
 - b. $\text{H}_2\text{CO}_3 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
 - c. $6 \text{CO}_2 + 6 \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6$
71. Which of the following reflects the correct partial pressures of O₂ in the alveoli, blood and tissues?
- a. Alveoli > blood > tissues
 - b. Blood > alveoli > tissues
 - c. Tissues > blood > alveoli
 - d. Blood > tissues > alveoli
 - e. Depends on your current level of activity
72. Which of the following comprise the respiratory membrane?
- a. Simple squamous cells lining alveoli
 - b. Basal lamina
 - c. Simple squamous cells of endothelium
 - d. A and C only
 - e. None of the above (all are part of the respiratory membrane)

73. Why does air move into the lungs during inspiration?
- Muscles of the throat push air from the mouth into the airways
 - The size of the thoracic cavity increases
 - The pressure in the thoracic cavity dips below atmospheric pressure
 - B and C
 - All of the above
74. Which of the following would NOT lead to an increase in breathing rate and depth:
- Increased sympathetic influence
 - Increased blood CO₂
 - Decreased pH of the Cerebrospinal Fluid
 - Decreased blood CO₂
 - Decreased blood O₂
75. The component of hemoglobin that actually binds O₂ temporarily is:
- The beta chains
 - The alpha chains
 - Iron
 - Heme
76. The stem cell that gives rise to all erythrocytes, platelets and leukocytes is:
- Megakaryocyte
 - Myeloid stem cell
 - Lymphoid stem cell
 - Hemocytoblast
 - Proerythroblast
77. Jaundice is a condition in which there is an excess of a yellowish pigment in the blood. Where does that pigment originate?
- Erythrocytes
 - Leukocytes
 - Kidneys
 - Retina
 - Melanocytes
78. Which of the following do NOT occur during the erythroblast/normoblast stages of erythropoiesis:
- Organelles are ejected
 - Nucleus is ejected
 - Fe is collected
 - Hb is synthesized
 - Immature RBC is released to the blood

79. The role of fibrin in blood clotting is:
- Activates factor X
 - Forms a mesh around injured area
 - Digests the clot
 - Induces vascular spasms
 - Activates thrombin
80. Which of the following cell type/s is/are capable of spontaneous depolarization?
- Cardiac muscle conducting cells
 - Cardiac muscle contractile cells
 - Skeletal muscle cells
 - A and B
 - A and C
81. During a heartbeat, individual cardiac muscle cells experience:
- Complete tetany
 - Incomplete tetany
 - Single extended twitch
 - None of the above
82. When the ventricles contract, the _____ valves open and the _____ valves shut.
- AV; semilunar
 - Semilunar; AV
 - Right AV and semilunar; left AV and semilunar
 - Left AV and semilunar; right AV and semilunar
83. Which of the following is NOT a function of erythrocytes related to their shape?
- High surface area: volume
 - Allows single file stacking through capillaries
 - Allows flexing and bending through really tiny capillaries
 - Allows RBC to squeeze through spaces in capillaries to leave the blood and enter tissues
84. Which of the following statements about the cardiac cycle is NOT true?
- Both ventricles contract at the same time
 - Ventricular systole closes the AV valves and opens the semilunar valves
 - Pressure within the chambers is never equal, so there is never a moment when all four valves are closed at the same time
 - Atria contract before the ventricles because atrial contractile cells are electrically isolated from ventricular cells and there is a delay in getting the impulse to ventricular contractile cells

85. Which of the following most accurately describes Cardiac Output?
- The amount of blood pumped out by a ventricle in one minute
 - The number of times the ventricles contract per minute
 - The amount of blood pumped out of the heart during each beat
 - The amount of blood left in the ventricles after ventricular systole
 - B and D
86. In what part of a capillary bed is Blood Colloid Osmotic Pressure greater than Capillary Hydrostatic Pressure?
- Arterial end
 - Venous end
 - Midway through the capillary
 - Pre-capillary sphincter
87. How would a protein deficiency affect capillary dynamics?
- Too much fluid would be reabsorbed into the capillary and blood pressure would increase
 - Protein channels allowing fluid/solutes into the lymphatic capillaries would not be built, so fluid would build up in tissues
 - Too little fluid would be reabsorbed into the capillary and fluid would build up in tissues
 - Any of the above are possible
88. Mean Arterial Pressure (MAP) is important because it tells you:
- The “average” pressure of the arteries, to be compared with the pressure of the smallest arterioles and capillaries, determining the pressure differential which will drive blood forward
 - Your heart rate
 - What the average cardiac output is
 - None of the above
89. Which of the following would lead to a **decrease** in Cardiac Output?
- NorEpinephrine
 - Triiodothyronine (thyroid hormone)
 - Low afterload (low pressure in the great arteries)
 - Low End Diastolic Volume (low preload)
 - High End Diastolic Volume
90. The P wave of an electrocardiogram (ECG) indicates:
- Ventricular repolarization
 - Atrial repolarization
 - Ventricular depolarization
 - Atrial depolarization

91. Exocrine pancreatic cells secrete _____ into the duodenum, through the _____.
- Insulin; common bile duct
 - Bile; common bile duct
 - HCO₃⁻; acini
 - HCO₃⁻ plus lipases, amylases and proteases; hepatopancreatic sphincter
 - Amylase and lipase only; pancreatic duct
92. The first place starch will be chemically digested is in the _____ because of the action of _____.
- Stomach; pepsin
 - Small intestine; bile
 - Small intestine; carboxypeptidase
 - Oral cavity; amylase
 - Esophagus; lipase
93. What will happen to Fe when an erythrocyte is phagocytosed?
- It will be bound by transferrin
 - It will travel to the red marrow
 - It will travel to the liver
 - All of the above
 - None of the above; it will be excreted in bile
94. Skeletal muscle cells are brought to threshold when Ach binds Na⁺ channels at the motor end plate. What brings cardiac contractile muscle to threshold?
- Na⁺ ions diffusing through gap junctions from neighboring cells
 - K⁺ entry from conducting cells
 - Ach binding at the SA node
 - Slow repolarization/plateau
95. Which of the following is/are important for causing a delay between atrial systole and ventricular systole:
- Slow Ca²⁺ channels allow Ca²⁺ to come in, keeping the voltage around 0 mV for an extended period
 - Atrial contractile cells are not connected to ventricular cells via gap junctions
 - Impulses must travel all the way to Purkinje fibers before ventricular contractile cells are affected.
 - A and C
 - B and C
96. The plateau phase of cardiac muscle cell contraction represents:
- An extended twitch, in which the cell remains contracted
 - A period when Ca²⁺ is entering the cell
 - A period when the cell remains at a depolarized voltage (around 0 mV)
 - A and C
 - All of the above

97. The facts that: a) repolarization is delayed, and b) Ca^{2+} is returned to the SR or interstitium before Na^{+} channels can respond to another impulse, are important because:
- Cardiac cells come to a complete rest between each twitch (contraction)
 - The heart is allowed to remain in complete tetanus for extended periods
 - Allows the atria to contract before the ventricles
 - All of the above
98. ANS fibers traveling to the heart are controlled by the cardiovascular centers. Where are the cardiovascular centers located?
- Pons
 - Medulla
 - Hypothalamus
 - Carotid bodies
99. What do the following have in common: bile, microvilli, erythrocyte shape, HCl?
- Each carries a substance through a fluid
 - Each maximizes surface area in some way
 - Each is part of a cell
 - Each is produced by the pancreas
 - Each houses enzymes

Short Answer: This is the only part you need to print out and hand in. Do NOT staple it to the Scan Tron. You should not need more space than that provided-

100. Answer the following:
- a. List the 3 phases of hemostasis, and state one event which will happen during EACH phase.
 - i. -
 - ii. -
 - iii. -
 - b. Briefly describe one thing that will aid in the clean-up or control of a clot.
101. What is one reason it is important that chyme is delivered slowly from the stomach to the small intestine?

102. Complete the following charts:
- a. For each of the listed organs, name the inactive protease/s secreted there, name the active protease and describe how each is activated. Exclude proelastase. Not all of the boxes will be filled!

Organ	Inactive Protease	How activated?
Stomach		
Small Intestine		

(continued)

b. Place a check in the boxes to indicate which of the following nutrients are enzymatically digested in each of the organs listed:

Organ	Starches	Proteins	Triglycerides	Disaccharides
Mouth				
Esophagus				
Stomach				
Small Intestine				

103. Complete the following charts:

a. Ovarian cycle

Phase (name)	Dominant pituitary hormone	Days	Structure formed

b. Uterine cycle

Phase	Dominant Ovarian Hormone	Days	Endometrial Events

Short Essay

104. Explain how rising levels of blood CO₂ will affect:

- a) pH of the CSF
- b) Respiratory Rate
- c) Heart Rate
- d) (optional, 1 point ec) blood pressure.

Explain why these responses all make sense in terms of WHY blood CO₂ might rise.

(continued)

