

**BMD 334 Human Physiology
Practice Final
Sample 4 (Answers are in bold)**

Answer each of the following questions on the computer form. Each question is worth 2 points.

NEW MATERIAL

1. **Effector organs for the autonomic nervous system include**
 - A) cardiac muscle.
 - B) endocrine glands.
 - C) exocrine glands.
 - D) A and C
 - E) **All of the above**
2. **Which of the following neurons does NOT release acetylcholine?**
 - A) Sympathetic pre-ganglionic
 - B) **Sympathetic post-ganglionic**
 - C) Parasympathetic pre-ganglionic
 - D) Motor neuron
 - E) More than 1 of the above does not release acetylcholine
3. **The binding of acetylcholine to nicotinic cholinergic receptors**
 - A) occurs at the motor end plate
 - B) occurs at the SA node.
 - C) results in the opening of channels that permit both sodium and potassium to move through.
 - D) **A and C**
 - E) All of the above

Answer questions 4-7 using the following key.

- A) **Skeletal muscle**
 - B) **Smooth muscle**
 - C) **Skeletal and cardiac muscle**
 - D) **Smooth and cardiac muscle**
 - E) **Skeletal, smooth and cardiac muscle**
4. **Calcium binds to troponin to initiate contraction.** **C**
 5. **Contains actin and myosin** **E**
 6. **Dense bodies link the thin filaments together.** **B**
 7. **Calcium from the extracellular fluid induces calcium release from the sarcoplasmic reticulum.** **D**
 8. **During contraction of skeletal muscle,**
 - A) The A band gets shorter.
 - B) The I band gets longer.
 - C) **The H zone gets shorter.**
 - D) A and C
 - E) All of the above

9. **ATP binding to myosin**
A) causes the power stroke of the cross-bridge cycle.
B) causes the attachment of actin and myosin.
C) **causes the detachment of actin and myosin.**
D) causes tropomyosin to shift off of the binding sites on actin for myosin.
10. **Which of the following statements about skeletal muscle metabolism is true?**
A) Oxidative phosphorylation is the first source of energy, and remains the primary source until oxygen is depleted.
B) Creatine phosphate provides energy in the place of ATP when ATP supplies are low by binding directly to myosin.
C) **Anaerobic glycolysis is the primary energy source during intensity activity.**
D) A and C
E) All of the above
11. **Damage to the corticospinal tract causes**
A) spastic paralysis.
B) **flaccid paralysis.**
C) flaccid paralysis plus a loss of spinal reflexes.
12. **Which of the following muscle types contains myoglobin.**
A) Slow oxidative fibers
B) Fast oxidative fibers
C) Fast glycolytic fibers
D) **A and B**
E) B and C
13. **Which of the following muscle types can develop the most tension.**
A) Slow oxidative fibers
B) Fast oxidative fibers
C) **Fast glycolytic fibers**
D) A and B
E) B and C
14. **Which of the following will increase the strength of whole muscle contraction?**
A) Increase the rate of firing in alpha motor neurons.
B) Increase the resting length of the muscle to where the thin filaments just touch each other in the center of the sarcomere.
C) Recruit more motor units.
D) **A and C**
E) All of the above
15. **Which of the following muscles will have the smallest motor units?**
A) Latissimus dorsi, postural muscle of the back
B) Quadriceps femoris, muscle for extension at knee
C) Biceps brachii, muscle for extension at elbow
D) **Extensor carpi radialis, muscle for extension of finger**
16. **Which of the following adaptations will occur more so with jogging than with weight training?**
A) Increase production of capillaries to skeletal muscle.
B) Increase amount of actin and myosin.
C) Increase aerobic capacity of the muscle.
D) **A and C**
E) All of the above

17. **Arnold Schwarzeneger is attempting to curl 300 pounds (curling involves contraction of the biceps muscles to flex the arm). When his muscles first start contracting, the sarcomeres are shortening but he doesn't lift the weight as his biceps perform an _____ contraction. However, his biceps soon develop the tension necessary to move the 300 pounds and Arnold successfully performs an _____ contraction during which he curls the weight to the cheer of the audience.**
- A) **isometric / isotonic**
 - B) isotonic / isometric
 - C) isometric / isometric
 - D) isotonic / isotonic
18. **Which of the following statements about the muscle spindle is FALSE?**
- A) The muscle spindle is a stretch receptor that detects the length of skeletal muscle fibers and changes in the length.
 - B) Extrafusal fibers develop muscle tension during contraction whereas intrafusal muscle fibers put tension on the spindle making it more sensitive to detect changes in muscle length.
 - C) **Alpha motor neurons innervate the intrafusal muscle fibers whereas gamma motor neurons innervate extrafusal muscle fibers.**
 - D) A stretch of the muscle spindle induces a reflex contraction of the muscle.
19. **The area of the cerebral cortex that controls fine coordinated voluntary movements is**
- A) the primary motor cortex.
 - B) the brainstem.
 - C) in the frontal lobe.
 - D) **A and C**
 - E) B and C
20. **Valves are found in what area of the cardiovascular system?**
- A) Heart
 - B) Arteries
 - C) Veins
 - D) **A and C**
 - E) All of the above
21. **An increase in mean arterial pressure will do all of the following through the baroreceptor reflex EXCEPT**
- A) decrease heart rate.
 - B) decrease cardiac contractility.
 - C) **vasoconstrict arterioles.**
 - D) vasodilate veins.
 - E) decrease mean arterial pressure.
22. **The rapid depolarization phase of the ventricular muscle action potential is due to the opening of**
- A) **sodium channels.**
 - B) potassium channels.
 - C) calcium channels.
23. **The fastest depolarizing of cardiac autorhythmic cells are located in what structure?**
- A) AV Node
 - B) **SA Node**
 - C) Purkinje Fibers
 - D) Bundle of His

24. **The correct sequence of activation of cardiac tissue is**
A) AV Node - Bundle of His - Purkinje Fibers - SA Node
B) SA Node - Purkinje Fibers - Bundle of His - AV Node
C) Bundle of His - Purkinje Fibers - SA Node - AV Node
D) Purkinje Fibers - AV Node - SA Node - Bundle of His
E) **SA Node - AV Node - Bundle of His - Purkinje Fibers**
25. **AV valves open**
A) **passively when atrial pressure exceeds ventricular pressure.**
B) passively when ventricular pressure exceeds atrial pressure.
C) by active contraction of the papillary muscles.
D) by active contraction of the chordae tendinae.
26. **Ventricular depolarization is represented by which component of an ECG?**
A) P wave
B) **QRS complex**
C) T wave
27. **An increase in resting heart rate to greater than 100 beats/min is called**
A) heart block.
B) bradycardia.
C) **tachycardia.**
D) atrial flutter.
E) ventricular flutter.
28. **The stroke volume equals**
A) cardiac output x heart rate.
B) end diastolic volume.
C) end systolic volume.
D) **end diastolic volume - end systolic volume.**
E) approximately 5 liters at rest.
29. **Parasympathetic activity decreases blood pressure by**
A) **decreasing heart rate.**
B) decreasing stroke volume.
C) decreasing cardiac output.
D) decreasing total peripheral resistance.
E) All of the above
30. **During the phase of isovolumetric relaxation of the ventricles, the pressure in the ventricles is _____ and the AV valves are _____.**
A) increasing / closed
B) increasing / open
C) **decreasing / closed**
D) decreasing / open
E) not changing / closed
31. **Tissue edema may be caused by**
A) high blood pressure.
B) decreased plasma protein concentration.
C) leakage of plasma protein into the interstitial fluid.
D) blockage of lymphatic vessels.
E) **All of the above.**

32. Which of the following statements is FALSE?
- A) Most of the total blood volume is contained in the veins.
 - B) Veins have a greater total surface area than any other type of vessel.**
 - C) Exchanges between blood and tissue occur primarily across capillary walls.
 - D) Blood flow velocity is greatest in the large arteries of the body.
33. Blood flow to individual tissue is primarily controlled by
- A) local controls.**
 - B) the autonomic nervous system.
 - C) hormones.
 - D) B and C
34. Chemical factors that produce vasodilation include
- A. angiotensin II.
 - B. Endothelium Derived Relaxant Factors (EDRF).**
 - C. vasopressin.
 - D. All of the above
 - E. None of the above
35. Local causes of increased blood flow include all of the following EXCEPT
- A) histamine.
 - B) increased carbon dioxide.
 - C) increased potassium.
 - D) increased oxygen.**
36. Cardiac output can be increased by which of the following?
- A) Increasing sympathetic activity to the heart
 - B) Increasing sympathetic activity to the veins
 - C) Increasing ventricular end-diastolic volume
 - D) All of the above**
 - E) None of the above
37. Endothelial cells are found
- A) in the heart.
 - B) in the arteries.
 - C) in the capillaries.
 - D) in the veins.
 - E) All of the above**
38. Return of lymph to the heart is facilitated by
- A) skeletal muscle pump.
 - B) respiration pump.
 - C) presence of valves in the lymphatic vessels.
 - D) A and B
 - E) All of the above**
39. Your doctor tells you that your blood pressure is 100/70. What is your mean arterial pressure?
- A) 85 mmHg
 - B) 90 mmHg
 - C) 80 mmHg**
 - D) 30 mmHg

40. **Your doctor listens to your heart while recording an ECG. She distinguishes a murmur in association with the first heart sound that occurs at the same time as the QRS complex. What does this indicate?**
- A) There is backflow through the semilunar valves.
 - B) There is backflow through the AV valves.**
 - C) There is backflow through the aortic valve.
 - D) A and B are both true since the semilunar and AV valves are the same valves.
41. **While taking this exam, your heart rate is increased above normal. This is because**
- A) the sympathetic nervous system is more active during excitement (or for some of you stress).
 - B) norepinephrine binds to alpha adrenergic receptors in the SA node opening channels for potassium.
 - C) norepinephrine binds to beta-1 adrenergic receptors in the SA node opening both the I_f channels and calcium channels.
 - D) A and B
 - E) A and C**
42. **You drank too much caffeine last night while studying for this exam. Every once in a while, you feel your heart skip a beat. What you are actually feeling is the beat following the skipped beat. This beat is stronger because**
- A) there is a greater time between beats allowing for greater venous return, and therefore a stronger contraction.
 - B) the electrical activity of the heart builds up to twice the normal level of depolarization which leads to a stronger contraction.
 - C) The end diastolic volume is greater following a skipped beat, and therefore, the strength of contraction is stronger.
 - D) A and C**
 - E) All of the above
43. **Which of the following descriptions of blood vessels is incorrect?**
- A) Arteries are the most elastic.
 - B) Veins are the most compliant.
 - C) Capillaries are the site of exchange between blood and tissue.
 - D) Arterioles are the only blood vessels with smooth muscle innervated by the sympathetic nervous system.**
 - E) Metarterioles provide a passageway for blood from arterioles to venules while bypassing capillaries.
44. **Which of the following chambers of the heart has the thickest walls?**
- A) Right atrium
 - B) Left atrium
 - C) Right ventricle
 - D) Left ventricle**

45. During mild exercise, cardiac output increases to 10 L/min. What is the output from the right ventricle?
- A) 10 L/min
 - B) 5 L/min
 - C) 20 L/min
46. Which of the following forces across a capillary wall favors absorption?
- A) Colloid osmotic pressure of the plasma
 - B) Colloid osmotic pressure of the interstitial fluid
 - C) Hydraulic pressure of fluid in the capillary
 - D) A and C
 - E) B and C
47. Precapillary sphincters
- A) can be found on metarterioles.
 - B) are innervated by the sympathetic nervous system.
 - C) regulate blood flow through capillary beds.
 - D) **A and C**
 - E) All of the above
48. Which of the following descriptions best describes 3rd degree or complete heart block?
- A) The atria continue to contract at their normal rhythm, but the ventricles stop contracting.
 - B) **The atria continue to contract at their normal rhythm, and the ventricles start contracting at their own rhythm completely independent of the atria.**
 - C) Atrial and ventricular contractions occur simultaneously.
 - D) The one-to-one relationship between atrial and ventricular contractions is lost, but when the ventricles contract, they always follow the atrial contraction.
49. Which of the following events happens first?
- A) Blood is ejected from the atrium.
 - B) **The SA node fires an action potential.**
 - C) The P wave develops.
 - D) Ventricular systole occurs.
 - E) Atrial systole occurs.
50. During the plateau phase of the ventricular contractile cell action potential, what ion is moving into the cell?
- A) Sodium
 - B) Potassium
 - C) **Calcium**
 - D) Chloride

COMPREHENSIVE

51. Which of the following is the primary mechanism for maintaining homeostasis?
A) Positive feedback
B) Negative feedback
C) Teleological regulation
D) Mechanistic regulation
52. Which of the following descriptions **INCORRECTLY** describes the tissue type?
A) Muscle tissue is specialized for contraction and generation of force.
B) Epithelial tissue connects body parts together providing structural support.
C) Nervous tissue is specialized for transmission of electrical impulses.
D) None of the above. That is, A, B, and C are all correct descriptions.
53. Which of the following is the most lipophilic?
A) Glucose
B) Sucrose
C) Steroids
D) NaCl
54. **Nucleotides**
A) form the genetic material in the body.
B) contain at least one sugar and one phosphate.
C) function in the transfer of cellular energy.
D) All of the above
55. Which of the following is an **INCORRECT** description of the function of the organelle?
A) Oxidative phosphorylation occurs in the mitochondria.
B) Peptide hormone synthesis occurs in the rough endoplasmic reticulum.
C) Breakdown of phagocytosed debris occurs in the peroxisomes.
D) Packaging of secretory products into vesicles occurs in the golgi apparatus.
E) Calcium is stored in the smooth endoplasmic reticulum.
56. Which of the following is an example of covalent modulation?
A) **Norepinephrine binds to beta1 receptors activating the cAMP second messenger system. This results in phosphorylation of Ca channels, opening the channels.**
B) The end-product of a chemical reaction binds to the rate-limiting enzyme decreasing its activity.
C) The hormones glucagon and epinephrine both increase blood glucose, and if both are given simultaneously, the increase in blood glucose is greater than the sum of the individual effects.
D) Thyroid hormone must be present for normal development of the reproduction system.
57. Which of the following is a correct description of an anabolic pathway?
A) Proteins are transcribed from DNA in the nucleus.
B) Proteins are degraded by mRNA in the cytoplasm.
C) Glycogen is synthesized in the cytosol from glucose.
D) The primary site of the synthesis of triacylglycerols is in the liver.
E) The primary site of the breakdown of triacylglycerols is in the adipose tissue.
58. **In terms of energy production, the citric acid cycle is significant because it**
A) directly produces large amounts of ATP.
B) breaks down glucose.
C) reduces the coenzymes NAD and FADH for oxidative phosphorylation.
D) produces acetylcoenzyme A for fatty acid synthesis.

59. Which of the following is an **INCORRECT** description of special cell adhesions?
- A) Gap junctions form channels between cells.
 - B) **Tight junctions from strong junctions that resist mechanical stress.**
 - C) Intercalated disks contain both gap junctions and desmosomes.
60. **In facilitated diffusion**
- A) **A molecule is moved with its concentration gradient with the assistance of a protein carrier molecule, and no energy is required.**
 - B) a molecule is moved against its concentration gradient with the assistance of a protein carrier molecule and requires energy.
 - C) a molecule is moved against its concentration gradient with the assistance of a protein carrier molecule, but no energy is required.
 - D) A molecule is moved against its concentration gradient while Na is moved with its concentration gradient.
 - E) A molecule is moved with its concentration gradient while Na is moved against its concentration gradient.
61. **Osmosis**
- A) occurs from a high concentration of solute to a low concentration of solute.
 - B) **is the diffusion of water.**
 - C) occurs from a hypertonic region to a hypotonic region.
 - D) All of the above
62. **At the resting membrane potential of neurons**
- A) there are more sodium channels open than potassium channels.
 - B) there is a larger electrochemical force for sodium to move than for potassium to move.
 - C) sodium wants to move out of the cell whereas potassium wants to move into the cell.
 - D) All of the above
63. **A cell with normal intracellular osmolarity (300 mOsm) is placed in a solution of 125 mM NaCl and 50 mM glucose. The cell will**
- A) swell.
 - B) shrink.
 - C) **stay the same size.**
64. **Which of the following chemical messengers typically have actions on a cell close to the cell that released it?**
- A) Neurotransmitters
 - B) Hormones
 - C) Paracrines
 - D) **A and C**
 - E) All of the above
65. **Which of the following would NOT increase the rate of a chemical reaction?**
- A) Increasing the concentration of reactants
 - B) Increasing the temperature
 - C) **Increasing the activation energy**
 - D) Adding a catalyst
66. **Which of the following statements about the genetic code is FALSE?**
- A) mRNA is read 3 bases at a time, which are called codons.
 - B) Each codon is specific for only one amino acid.
 - C) **Each amino acid is coded for by only one codon.**
 - D) There are 3 termination codons, but only one initiator codon.

67. In smooth muscle, the ability of actin and myosin to interact is regulated by
- A) covalent modulation of myosin.
 - B) allosteric modulation of myosin.
 - C) allosteric modulation of actin.
 - D) allosteric modulation of troponin.
 - E) covalent modulation of calmodulin.
68. Rank the following from least to greatest according to ATP/production per mole. Assume all fatty acids to be 18 carbons in length.
- 1. Glucose under aerobic conditions
 - 2. Glucose under anaerobic conditions
 - 3. Triacylglycerol (triglyceride) under aerobic conditions
 - 4. Fatty acid under aerobic conditions
- A) 1234
 - B) 2134
 - C) **2143**
 - D) 4213
69. Membrane proteins can function as
- A) ion channels.
 - B) receptors.
 - C) cell adhesion molecules.
 - D) enzymes.
 - E) **All of the above**
70. Which of the following is NOT a component of the cAMP second messenger system?
- A) **Phospholipase C**
 - B) G proteins
 - C) Adenylyl cyclase
 - D) Protein kinase
71. Cation X^- is found in greater concentration inside the cell than outside. Which of the following statements best describes forces acting on X^- at the resting membrane potential (-70 mV)?
- A) The chemical force for X is to move into the cell and the electrical force is for X to move out of the cell.
 - B) **The chemical force for X is to move out of the cell and the electrical force is for X to move out of the cell.**
 - C) The chemical force for X is to move out of the cell and the electrical force is for X to move into the cell.
 - D) The chemical force for X is to move into the cell and the electrical force is for X to move into the cell.
72. Which of the following favors a fast diffusion rate across a capillary wall?
- A) Large surface area
 - B) Increased concentration gradients due to increased metabolic activity
 - C) Wall of the capillary is only one cell thick.
 - D) **All of the above**
73. Which of the following transport processes DOES NOT require energy?
- A) Calcium reuptake into the sarcoplasmic reticulum of skeletal muscle following a contraction
 - B) **Movement of sodium through voltage-gated sodium channels.**
 - C) Endocytosis
 - D) Exocytosis

74. **The rising phase of the action potential (depolarization) in neurons is characterized by**
- A) higher permeability to K^+ than to Na^+ .
 - B) higher permeability to Na^+ than to K^+ .
 - C) sodium movement into the cell.
 - D) A and C
 - E) **B and C**
75. **Which of the following is NOT a property of graded potentials?**
- A) Two graded potentials from different sources on the same neuron can sum.
 - B) Two graded potentials from the same source on one neuron can sum.
 - C) An EPSP is a depolarizing graded potential caused by the opening of channels for small cations, including BOTH Na^+ and K^+ .
 - D) **Pre-synaptic inhibition is produced by generating an IPSP on the axon terminal of one neuron synapsing on a second neuron.**
76. **Which of the following statements about refractory periods is FALSE?**
- A) The absolute refractory period is caused by voltage-dependent closing of the sodium inactivation gates.
 - B) **The relative refractory period is caused by time-dependent opening of the sodium inactivation gates.**
 - C) The refractory period of cardiac muscle is longer than the refractory period of skeletal muscle.
 - D) Summation of skeletal muscle can occur because the duration of contraction exceeds the duration of the refractory periods.
77. **Which of the following statements about action potentials is FALSE?**
- A) Action potentials propagate at a faster rate in large diameter axons compared to small diameter axons.
 - B) Action potentials propagate at a faster rate in myelinated axons compared to unmyelinated axons.
 - C) Action potentials are produced in all 3 classes of muscle cells.
 - D) Action potentials can be generated by spontaneous depolarizations in some types of cells.
 - E) **Action potentials can sum at high frequencies.**
78. **The steps of synaptic transmission at the motor end plate are listed below, out of order. Choose the correct order.**
1. **Voltage-dependent calcium channels on the plasma membrane open.**
 2. **Acetylcholine binds to post-synaptic receptors.**
 3. **An action potential arrives at the axon terminal.**
 4. **Acetylcholine is released by exocytosis.**
 5. **A graded depolarization is produced.**
 6. **An action potential is produced on the muscle cell membrane.**
 7. **Channels for both sodium and potassium are opened.**
- A) **3142756**
 - B) 1542763
 - C) 6142753
 - D) 3754216
 - E) 4215673

79. Which of the following is NOT a correct association between region of the central nervous system and function?
- A) **Hypothalamus : Motor inhibition**
 - B) Occipital Lobe : Vision
 - C) Cerebellum : Motor coordination
 - D) Brainstem : Autonomic regulation
 - E) Parietal Lobe : Somatic sensations
80. Which of the following reflexes is monosynaptic?
- A) Withdrawal reflex
 - B) Crossed-extensor reflex
 - C) **Stretch reflex**
 - D) Baroreceptor reflex
 - E) All of the above
81. The process by which sensory receptors convert physical energies into nerve impulses is called
- A) Adaptation
 - B) Conduction
 - C) **Transduction**
 - D) Neural Conversion
82. The left cerebral cortex
- A) receives touch information from the right side of the body.
 - B) receives pain information from the right side of the body.
 - C) receives visual information from the right visual field.
 - D) controls motor function of the right side of the body.
 - E) **All of the above**
83. Which of the following is NOT the correct association between receptor type and sensory input?
- A) **Nociceptor : Temperature**
 - B) Chemoreceptor : Taste
 - C) Hair Cell : Hearing
 - D) Cones : Vision
 - E) Mechanoreceptor : Blood pressure
84. Which of the following statements is FALSE?
- A) The afferents for ALL special senses are in the cranial nerves.
 - B) The fovea is the site of the retina with highest visual acuity.
 - C) The pitch of sound is coded in the location of movement of the basilar membrane.
 - D) **The semicircular canals equilibriate pressure between the middle ear and the environment.**
85. Which of the following hormones is a trophic hormone?
- A) **ACTH**
 - B) Oxytocin
 - C) Prolactin
 - D) Thyroid hormone
 - E) All of the above

86. **Glycine is a common inhibitory neurotransmitter in the CNS which**
- A) **opens potassium channels producing IPSPs.**
 - B) opens sodium channels producing EPSPs.
 - C) opens channels for potassium and sodium producing IPSPs.
 - D) opens channels for potassium and sodium producing EPSPs.
87. **Steroid hormones**
- A) are transported in the blood by protein carriers.
 - B) bind to receptors in the cytosol.
 - C) alter transcription of DNA in the nucleus.
 - D) **All of the above**
 - E) None of the above
88. **Epinephrine is**
- A) a catecholamine.
 - B) released from the adrenal medulla.
 - C) a hormone released during activation of the sympathetic nervous system.
 - D) **All of the above**
 - E) None of the above
89. **Oligodendrocytes**
- A) form the blood brain barrier by linking the endothelial cells of brain capillaries together.
 - B) **form myelin in the CNS.**
 - C) are phagocytes that protect the brain from foreign invaders.
 - D) are neurons that carry information from one side of the cerebrum to the other.
 - E) are areas of neurons that receive synaptic communication from other neurons.
90. **Which of the following occurs during accommodation?**
- A) Ciliary muscles relax.
 - B) Zonular fibers go taut (no slack).
 - C) **The lens becomes rounder.**
 - D) A and C
 - E) All of the above
91. **The main products of anaerobic glycolysis are**
- A) 36-38 ATP, 2 pyruvic acid, 2 NADH
 - B) 2 ATP, 2 pyruvic acid, 2 NADH
 - C) 36-38 ATP, 2 lactic acid
 - D) **2 ATP, 2 lactic acid**
 - E) No ATP, 2 lactic acid, carbon dioxide
92. **Actin and myosin are what class of organic molecules?**
- A) Carbohydrates
 - B) Lipids
 - C) **Proteins**
 - D) Nucleotides

93. **Where are the components of the electron transport chain?**
A) Cytosol
B) Mitochondrial matrix
C) **Inner mitochondrial membrane**
D) Lumen of the smooth endoplasmic reticulum
94. **The equilibrium potential for anion X (X⁻) is -100 mV. The resting membrane potential of a neuron is -70 mV. If channels for this ion on the plasma membrane open, then the membrane potential will**
A) depolarize.
B) **hyperpolarize.**
C) stay at -70 mV.
D) there is not enough information to answer this question.
95. **Rapid, long-distance communication is carried out by the**
A) **nervous system.**
B) endocrine system.
C) release of paracrines.
96. **Referred pain**
A) is the sensation of a noxious stimulus applied to one part of the body perceived as originating in another site.
B) is the decrease in pain perception produced by activation of the endogenous analgesia systems.
C) is caused by converging input from visceral afferents and somatic afferents onto the same second order neuron.
D) **A and C**
E) B and C
97. **Chemoreceptors are found**
A) in taste buds.
B) in the vestibular apparatus.
C) in the olfactory mucosa.
D) **A and C**
E) All of the above
98. **Which of the following are amphipathic molecules?**
A) Phospholipids
B) Fatty acids
C) Membrane spanning proteins
D) **A and C**
E) All of the above
99. **Which of the following changes in blood pH might occur following anaerobic exercise?**
A) Increase pH
B) **Decrease pH**

- 100. Glycogen stores are generally limited to use by the cell containing the glycogen since glucose-6-phosphate cannot be transported across cell membranes. However, one organ is especially important in breaking down glycogen and releasing glucose into the blood where it can be picked up by cells needing it. What organ is this?**
- A) Skeletal muscle
 - B) Cardiac muscle
 - C) **Liver**
 - D) Pancreas

BONUS QUESTIONS

- 101. Who hit 70 home runs this year to break the record for most homeruns in a single season?**
- A) Dr. Thurston's favorite baseball player
 - B) Number 25 for the St. Louis Cardinals (formerly #25 for the Oakland A's)
 - C) The same player who hit 58 home runs last year without any supplements.
 - D) Mark McGwire
 - E) **All of the above (HINT: This is the answer, for those of you who don't follow baseball.)**
- 102. Who also broke Roger Maris' record, but could not top "the man" Mark McGwire?**
- A) **Sammy Sosa**