

**BMD 334 Human Physiology  
Practice Final  
Sample 3**

**COMPREHENSIVE**

1. **Which of the following statements about homeostasis is FALSE?**
  - A) The extracellular fluid is maintained in a state compatible for life.
  - B) The primary mechanism to maintain homeostasis is negative feedback.
  - C) The organ systems work together to maintain homeostasis.
  - D) The extracellular fluid makes up the majority of the body fluids.
  
2. **What type of bond links amino acids together to form a protein?**
  - A) Hydrogen bonds
  - B) Amine bonds
  - C) Peptide bonds
  - D) Kinetic bonds
  
3. **Which of the following occurs in mitochondria?**
  - A) Krebs cycle (a.k.a. Krebs cycle or Citric acid cycle)
  - B) Oxidative phosphorylation
  - C) Consumption of oxygen and production of carbon dioxide
  - D) Conversion of pyruvic acid to acetyl CoA
  - E) All of the above
  
4. **Which type of cell junction limits the movement of molecules between cells and tends to be found in epithelial tissue?**
  - A) Desmosomes
  - B) Tight Junctions
  - C) Gap Junctions
  - D) None of the above
  
5. **Which of the following organic molecules can be converted into fat, either directly or through a number of steps?**
  - A) Carbohydrates
  - B) Proteins
  - C) Fatty acids
  - D) A and C
  - E) All of the above
  
6. **Which of the following is NOT a correct association between region of the central nervous system and function?**
  - A) Temporal Lobe : Hearing
  - B) Occipital Lobe : Vision
  - C) Cerebellum : Language
  - D) Brainstem : Autonomic regulation
  - E) Parietal Lobe : Somatic sensations
  
7. **Endocrine glands**
  - A) are derived from epithelial tissue.
  - B) have ducts.
  - C) secrete hormones.
  - D) A and C
  - E) All of the above

8. **Which of the following best describes a 1% solution of NaCl?**  
A) 1 gm NaCl in 1 liter water  
B) 0.5 gm NaCl in 1 liter water  
C) 1 gm NaCl in 100 ml water  
D) 0.5 gm NaCl in 100 ml water
9. **Which of the following polymers is incorrectly matched with its subunit?**  
A) Proteins – Amino acids  
B) DNA - Nucleotides  
C) Glycogen - Sucrose  
D) RNA - Nucleotides
10. **Which of the following solutions has the lowest pH?**  
A)  $10^{-3}$  M strong acid  
B)  $10^{-3}$  M weak acid  
C)  $10^{-4}$  M strong acid  
D)  $10^{-4}$  M weak acid
11. **How many ATP are generated per acetyl coenzyme A going through the Krebs cycle followed by the electron transport system?**  
A) 2  
B) 3  
C) 12  
D) 24  
E) 36-38
12. **Actin is what type of protein?**  
A) Microfilament  
B) Intermediate filament  
C) Microtubule  
D) None of the above
13. **Covalent modulation is catalyzed by what type of enzyme?**  
A) Adenylyl cyclase  
B) Phospholipase C  
C) RNA polymerase  
D) Protein kinase
14. **Under anaerobic conditions, what is pyruvic acid converted to?**  
A) Acetyl coenzyme A  
B) Lactic acid  
C) Glucose  
D) Amino acid
15. **Affinity is a measure of**  
A) the rate of an enzyme catalyzed reaction.  
B) permeability of muscle cells to calcium.  
C) whether or not a molecule is phosphorylated.  
D) the strength of interactions between a ligand and binding site.

16. **The reuptake of acetylcholine into an axon terminal is a form of secondary active transport with sodium. Which of the following statements is false?**
- A) The transport process is cotransport with sodium.
  - B) The transporter can be saturated.
  - C) The process is passive.
  - D) All of the above
  - E) None of the above
17. **Tetrodotoxin is a toxin that blocks voltage-gated sodium channels. What effect would this substance have on the function of neurons?**
- A) Neurons would depolarize more rapidly.
  - B) Action potentials would lack a repolarization phase.
  - C) The absolute refractory period would be shorter than normal.
  - D) The neuron would not be able to propagate action potentials.
18. **The resting membrane potential is**
- A) much closer to the equilibrium potential for potassium than to the equilibrium potential for sodium.
  - B) negative on the inside relative to outside.
  - C) Both A and B are true
  - D) Neither A nor B is true
19. **Triglycerides are synthesized in what organelle?**
- A) Mitochondria
  - B) Rough endoplasmic reticulum
  - C) Smooth endoplasmic reticulum
  - D) Golgi apparatus
  - E) Lysosomes
20. **The equilibrium potential for cation  $A^+$  is  $-20$  mV. Which of the following statements is true?**
- A)  $A^+$  is located in greater concentration inside the cell than outside.
  - B) At the resting membrane potential, the electrochemical force on  $A^+$  is to move out of the cell.
  - C) Both A and B are true
  - D) Neither A nor B is true
21. **During synaptic transmission, the role of voltage-gated  $Ca^{++}$  channels is to**
- A) depolarize the presynaptic terminal.
  - B) depolarize the post-synaptic cell.
  - C) increase  $Ca^{++}$  concentration in the presynaptic terminal which leads to exocytosis of neurotransmitter.
  - D) increase  $Ca^{++}$  concentration in the post-synaptic cell which leads to post-synaptic inhibition.
22. **During facilitated diffusion of glucose,**
- A) glucose moves into the cell with sodium ions.
  - B) glucose moves from high glucose concentration to low glucose concentration.
  - C) energy is required.
  - D) All of the above
23. **A cell of normal osmolarity is placed in 200 mM  $MgCl_2$  solution. The cell will \_\_\_\_\_.**
- A) shrink
  - B) swell
  - C) not change size

24. **Which of the following is located in greater concentration outside the cell compared to outside?**
- A) Sodium ions
  - B) Potassium ions
  - C) Proteins
  - D) A and C
  - E) All of the above
25. **What endocrine gland secretes ACTH?**
- A) Hypothalamus
  - B) Anterior pituitary
  - C) Posterior pituitary
  - D) Adrenal cortex
  - E) Pancreas
26. **Which of the following hormones is not a steroid hormone?**
- A) Testosterone
  - B) Aldosterone
  - C) Progesterone
  - D) Thyroid hormone
27. **A codon is**
- A) a series of three nucleotides found in mRNA.
  - B) the sequence of amino acids within a protein.
  - C) a monosaccharide linked to a disaccharide.
  - D) used by James Bond in secret communications with Her Majesty's Secret Service.
28. **The enzyme that converts ATP to cAMP is called**
- A) phospholipase C.
  - B) adenylyl cyclase.
  - C) myosin light chain kinase.
  - D) phosphatase
29. **Which class of neurons is the most abundant in the nervous system?**
- A) Afferents
  - B) Efferents
  - C) Interneurons
30. **Which of the following statements about refractory periods is FALSE?**
- A) During the absolute refractory period, a second action potential can be produced with a stimulus that exceeds the threshold.
  - B) The absolute refractory period is caused by the closing of the sodium inactivation gates.
  - C) The refractory period prevents summation of action potentials.
  - D) The refractory period ensures unidirectional conduction of action potentials.
31. **Which of the following describes the events in the post-synaptic cell at an excitatory synapse?**
- A) Channels that let both  $\text{Na}^+$  and  $\text{K}^+$  move through open. Both ions move into the post-synaptic cell causing a depolarization.
  - B) Channels that let only  $\text{Na}^+$  move through open. Sodium ions move into the post-synaptic cell causing a depolarization.
  - C) The post-synaptic cell membrane is stabilized to resist any changes in membrane potential.
  - D) None of the above
32. **Of the chemical bonding types listed, which is the strongest?**
- A) Ionic
  - B) Hydrogen
  - C) Covalent

33. **Which of the following is part of a positive feedback loop?**  
A) TRH stimulates TSH release from the anterior pituitary.  
B) Depolarization opens sodium channels, which causes depolarization.  
C) Once initiated, action potentials are propagated from trigger zone to axon terminal.  
D) The end-product of a metabolic pathway inhibits the rate-limiting enzyme.
34. **Transcription occurs in the \_\_\_\_\_ and produces a molecule of \_\_\_\_\_.**  
A) nucleus, DNA  
B) nucleus, RNA  
C) cytoplasm, RNA  
D) cytoplasm, protein
35. **Parkinson's disease is associated with the loss of what neurotransmitter from the basal nuclei?**  
A) Epinephrine  
B) Acetylcholine  
C) Glycine  
D) Dopamine  
E) Enkephalin
36. **What are the 2 extracellular fluid compartments of the body?**  
A) Intracellular fluid and Interstitial fluid  
B) Intracellular fluid and Plasma  
C) Intracellular fluid and Blood  
D) Interstitial fluid and Plasma  
E) Interstitial fluid and Blood
37. **Which of the following statements about the  $\text{Na}^+/\text{K}^+$ -ATPase is FALSE?**  
A) It transports sodium out of the cell and potassium into the cell.  
B) It transports sodium and potassium in a 2:1 ratio.  
C) It is present in neurons.  
D) Its activity requires the direct expenditure of metabolic energy.  
E) It is a form of primary active transport.
38. **What neurotransmitter binds to NMDA receptors?**  
A) Acetylcholine  
B) Glycine  
C) Glutamate  
D) Dopamine  
E) Enkephalin
39. **Which of the following is the most hydrophobic?**  
A) Carbohydrates  
B) Steroids  
C) Peptides  
D) Catecholamines
40. **Which organ/tissue provides glucose to the blood so that it can travel to cells throughout the body?**  
A) Adipose tissue  
B) Liver  
C) Skeletal muscle  
D) Brain
41. **Which of the following is triggered by calcium?**  
A) Release of neurotransmitter  
B) Skeletal muscle contraction  
C) Smooth muscle contraction  
D) All of the above

- 42. Lipophilic messengers**
- A) can only bind to receptors on the cell membrane.
  - B) bind to receptors inside the cytoplasm or nucleus.
  - C) function primarily by activating second messenger systems.
  - D) A and C
  - E) B and C
- 43. Where is most of the ATP in cells generated?**
- A) Cytosol
  - B) Nucleus
  - C) Mitochondria
  - D) Endoplasmic reticulum
  - E) Golgi apparatus
- 44. Where do somatic motor neurons originate?**
- A) Ventral horn of the spinal cord
  - B) Dorsal horn of the spinal cord
  - C) Ventral root ganglia
  - D) Dorsal root ganglia
  - E) Sensory receptors
- 45. In order to bombard the post-synaptic cell with more molecules of neurotransmitter, the pre-synaptic cell would have to**
- A) send action potentials with higher amplitude to the axon terminal.
  - B) send action potentials with longer durations to the axon terminal.
  - C) send action potentials at a higher frequency to the axon terminal.
  - D) do nothing; no change is possible since the all-or-none law is in effect.
- 46. The repolarization phase of action potentials in neurons is due primarily to**
- A) increased activity of the sodium-potassium ATPase.
  - B) sodium flow out of the cell.
  - C) sodium flow into the cell.
  - D) potassium flow into the cell.
  - E) potassium flow out of the cell.
- 47. Which of the following endocrine gland secretes a trophic hormone?**
- A) Hypothalamus
  - B) Posterior pituitary
  - C) Adrenal gland
  - D) All of the above
- 48. The resting membrane potential results from**
- A) uneven distribution of ions across the cell membrane.
  - B) differences in membrane permeability to sodium and potassium.
  - C) Both A and B are true.
  - D) Neither A nor B is true.
- 49. Anabolism**
- A) is the synthesis of molecules.
  - B) is the breakdown of molecules.
  - C) requires an input of energy.
  - D) A and C.
  - E) B and C.

- 50. Which of the following is a function of the hypothalamus?**
- A) Regulation of body temperature
  - B) Regulate circadian rhythms
  - C) Regulate the release of trophic hormones from the anterior pituitary.
  - D) A and C
  - E) All of the above

### NEW MATERIAL

- 51. Somesthetic sensations include**
- A) pain.
  - B) proprioception.
  - C) touch.
  - D) A and C
  - E) All of the above
- 52. According to the Law of Specific Nerve Energies, you see with your**
- A) eyes.
  - B) ears.
  - C) nose.
  - D) mouth.
  - E) fingers.
- 53. Which of the following statements about thermoreceptors is true?**
- A) The frequency of action potentials in the primary afferent associated with warm receptors is greater at 40 degrees than at 34 degrees.
  - B) The frequency of action potentials in the primary afferent associated with cold receptors is greater at 30 degrees than at 24 degrees.
  - C) Both A and B are true.
  - D) Neither A nor B is true.
- 54. Receptors for taste are located on \_\_\_\_.**
- A) Cilia
  - B) Stereocilia
  - C) Kinocilia
  - D) Microvilli
- 55. Nociceptors are the sensory receptors for**
- A) taste.
  - B) angular rotation.
  - C) pain.
  - D) vision.
  - E) linear acceleration.
- 56. Rapidly-adapting receptors**
- A) are also called tonic receptors.
  - B) respond best to changes in a stimulus.
  - C) continue to respond throughout the duration of a stimulus.
  - D) A and B
  - E) A and C

57. **Fast pain, usually described as a sharp pricking sensation, is transmitted to the CNS by**
- A) large diameter, unmyelinated C fibers.
  - B) large diameter, unmyelinated A-delta fibers.
  - C) small diameter, unmyelinated C fibers.
  - D) small diameter, lightly myelinated C fibers.
  - E) small diameter, lightly myelinated A-delta fibers.
58. **Eddie was in an accident where he damaged the whole right side of his spinal cord at the cervical level. Which of the following would be symptoms observed in Eddie?**
- A) Loss of pain sensation from his right leg.
  - B) Loss of warmth sensation from his right leg.
  - C) Loss of touch sensation from his right leg.
  - D) A and C
  - E) All of the above
59. **Enkephalins can decrease our perception of pain by**
- A) pre-synaptic inhibition of substance P release from an afferent for pain.
  - B) pre-synaptic facilitation of substance P release from an afferent for pain.
  - C) binding to opiate receptors on the second-order neuron in the pathway for pain and producing an IPSP.
  - D) A and C
  - E) B and C
60. **Vitreous humor is located**
- A) in the nasal cavity to dissolve odorant molecules.
  - B) in the oral cavity (mouth) to dissolve taste molecules.
  - C) in the ear canal to form ear wax.
  - D) in the eye to make it spherical.
  - E) in the cerebral ventricles to make us laugh.
61. **Sour taste is produced by the presence of hydrogen ions. The hydrogen ions**
- A) open sodium channels in the receptor cells.
  - B) close potassium channels through activation of cAMP in the receptor cells.
  - C) block potassium channels in the receptor cells.
  - D) are toxic to all receptor cells producing a massive depolarization.
62. **Which of the following occurs in the light?**
- A) The photopigment dissociates into an opsin and retinene.
  - B) cGMP levels increase in the outer segment.
  - C) Sodium channels open in the outer segment.
  - D) Calcium channels open in the synaptic terminal.
  - E) All of the above
63. **A blind spot in the retina occurs where**
- A) the fovea is located.
  - B) ganglion cells synapse with bipolar cells.
  - C) the optic nerve leaves the eye.
  - D) blood vessels are between the path of light and the photoreceptors.
  - E) amacrine cells are located.

- 64. Low frequency sound waves create their maximum displacement on what area of the basilar membrane?**
- A) Near the helicotrema
  - B) Near the oval (or round) window
- 65. Displacement of stereocilia toward the kinocilium of a hair cell**
- A) produces a depolarization of the membrane.
  - B) increases the frequency of action potentials on the associated afferent from the cochlear nerve.
  - C) increases the frequency of action potentials on the associated afferent from the vestibular nerve.
  - D) A and B
  - E) A and C
- 66. Pupillary constriction is caused by**
- A) contraction of the circular muscle of the iris.
  - B) contraction of the radial muscle of the iris.
  - C) contraction of the ciliary muscle.
  - D) relaxation of the ciliary muscle.
- 67. Neurotransmitters of the autonomic nervous system are released from**
- A) axon terminals.
  - B) dendrites.
  - C) cell body.
  - D) ganglia.
  - E) varicosities.
- 68. Nicotinic cholinergic receptors**
- A) bind acetylcholine and open ion channels for sodium and potassium.
  - B) are found on the cell body and dendrites of both sympathetic and parasympathetic post-ganglionic neurons.
  - C) are found on skeletal muscle fibers at the motor end plate.
  - D) A and C
  - E) All of the above
- 69. The alpha receptors that generally result in excitation when the appropriate ligand is bound are**
- A) Alpha
  - B) Beta 1
  - C) Beta 2
  - D) A and B
  - E) A and C
- 70. Every Monday, Wednesday, and Friday at 7:55 am you are excited in anticipation of learning more physiology (if not, then assume so for the sake of the question). Your heart rate increases, blood pressure increases, and pupils dilate with the excitement. What branch of the nervous system has been activated?**
- A) Afferent
  - B) Somatic efferent
  - C) Parasympathetic
  - D) Sympathetic
- 71. Which of the following control centers is found in the brain stem?**

- A) Respiration
- B) Cardiovascular
- C) Sleep
- D) A and C
- E) All of the above

**72. The purpose of transverse (t) tubules is to**

- A) ensure a supply of calcium throughout the muscle fiber.
- B) rapidly conduct action potentials to the interior of the muscle fiber.
- C) ensure a supply of glycogen throughout the muscle sarcoplasm.
- D) transport calcium out of the sarcoplasm for relaxation.
- E) All of the above

**73. What is the lightest color region of the sarcomere, occupied only by thin filaments?**

- A) A bands
- B) I bands
- C) Z disks (Z lines)
- D) H zone
- E) M line

**74. The steps of synaptic transmission at the motor end plate are listed below, out of order. Choose the correct order.**

1. Acetylcholine binds to post-synaptic receptors.
2. Voltage-dependent calcium channels on the plasma membrane open.
3. Acetylcholine is released by exocytosis.
4. A graded depolarization is produced.
5. An action potential arrives at the axon terminal.
6. An action potential is produced on the muscle cell membrane.
7. Channels for both sodium and potassium are opened.

- A) 3142756
- B) 4251736
- C) 5231746
- D) 3754216
- E) 4215673

**75. An end plate potential**

- A) is a graded potential on skeletal muscle.
- B) is a depolarization produced by the opening of channels for small cations including both sodium and potassium.
- C) will always be of sufficient magnitude to produce an action potential in healthy muscle cells.
- D) A and C
- E) All of the above

**76. Which of the following is characteristic of slow oxidative muscle?**

- A) red muscle
- B) small diameter fibers
- C) low ATPase activity
- D) A and C
- E) All of the above

**77. Which of the following is true of skeletal AND cardiac muscle, but NOT smooth muscle?**

- A) striated
- B) contracts by sliding filament mechanism and cross-bridge cycling
- C) contains t-tubules
- D) A and C
- E) All of the above

- 78. Calcium binding to calmodulin regulates muscle contraction for what type of muscle?**
- A) Skeletal muscle
  - B) Cardiac muscle
  - C) Smooth muscle
  - D) A and B
  - E) B and C
- 79. Which class of skeletal muscle would contain the greatest number of mitochondria per unit volume?**
- A) Slow oxidative
  - B) Fast oxidative
  - C) Fast glycolytic
- 80. Which of the following statements best defines a motor unit?**
- A) A motor unit is all the muscle fibers in a fascicle.
  - B) A motor unit is all the myofibrils in a muscle fiber.
  - C) A motor unit is a motor neuron and all the muscle fibers it innervates.
  - D) A motor unit is a muscle fiber and all motor neurons that innervate it.
- 81. Jack tries to impress Jill by bench pressing 100 pounds. However, Jack should have tried 50 pounds because he could not budge 100 pounds. Jack performed what type of muscle contraction for Jill?**
- A) Isotonic
  - B) Isometric
- 82. Where are gap junctions commonly found?**
- A) Single unit smooth muscle
  - B) Multi-unit smooth muscle
  - C) Cardiac muscle
  - D) A and C
  - E) All of the above
- 83. Myosin ATPase activity is slowest in which type of muscle?**
- A) Slow oxidative fibers
  - B) Fast glycolytic fibers
  - C) Smooth muscle
  - D) Cardiac muscle
- 84. At which adrenergic receptors is the affinity for epinephrine much greater than the affinity for norepinephrine?**
- A) Alpha
  - B) Beta-1
  - C) Beta-2
  - D) A and C
  - E) B and C
- 85. What type of receptors are located on the radial muscle of the iris?**
- A) Adrenergic

- B) Nicotinic cholinergic
- C) Muscarinic cholinergic

**86. Which of the following statements is true about the excitation-contraction coupling mechanism in skeletal muscle?**

- A) An action potential in the sarcolemma stimulates the opening of voltage-gated calcium channels in the plasma membrane and the sarcoplasmic reticulum.
- B) Calcium binds to troponin causing a shift in tropomyosin exposing the binding sites on actin for myosin.
- C) Calcium binds to tropomyosin causing a shift in troponin exposing the binding sites on actin for myosin.
- D) A and B
- E) A and C

**87. Which of the following neurons releases acetylcholine?**

- A) Parasympathetic pre-ganglionic
- B) Sympathetic pre-ganglionic
- C) Parasympathetic post-ganglionic
- D) A and C
- E) All of the above

**88. If a person wants to increase muscle mass, which of the following exercises would be best?**

- A) Sit on a couch and watch TV all day.
- B) Jog 5 miles 4 days a week.
- C) Lift weights 4 days a week.
- D) Jog 5 miles 2 days a week and lift weights 2 days a week.

**89. The transduction mechanism of which of the following sensory systems does not involve G-proteins?**

- A) Olfaction
- B) Vision
- C) Bitter taste
- D) Sweet taste
- E) Hearing

**90. The vagus nerve**

- A) transmits vestibular information to the brainstem.
- B) transmits auditory information to the brainstem.
- C) transmits olfactory information to the limbic system.
- D) is a major nerve of the sympathetic nervous system.
- E) is a major nerve of the parasympathetic nervous system.

**91. Which of the following statements about epinephrine is false?**

- A) Epinephrine is a hormone released during activation of the sympathetic nervous system.
- B) Sympathetic post-ganglionic neurons stimulate epinephrine release.
- C) Epinephrine is released from endocrine cells of the adrenal medulla.
- D) Epinephrine binds to adrenergic receptors.
- E) Epinephrine is a catecholamine.

**92. Which of the following occurs during accommodation?**

- A) Ciliary muscles contract.

- B) Zonular fibers go taut (no slack).
- C) The lens becomes rounder.
- D) A and C
- E) All of the above

**93. What separates the outer and middle ears?**

- A) Round window
- B) Oval window
- C) Tympanic membrane
- D) Ossicles
- E) Eustachian tube

**94. A decrease in the amplitude of a receptor potential in the presence of a continuing stimulus is called \_\_\_\_\_.**

- A) Habituation
- B) Adaptation
- C) Sensitization
- D) Transduction
- E) Localization

**95. What chemical class of messengers is substance P?**

- A) Steroid
- B) Peptide
- C) Amine
- D) Amino acid

**96. In order to smell something, the odorant must be dissolved in what?**

- A) Mucus
- B) Saliva
- C) Plasma
- D) Interstitial fluid
- E) Cerebrospinal fluid

**97. Which of the following is an incorrect match between cranial nerve and special sense?**

- A) Cranial nerve I - olfaction
- B) Cranial nerve VII - vision
- C) Cranial nerve VIII - hearing
- D) Cranial nerve VIII - equilibrium

**98. The connective tissue layer that surrounds individual muscle fibers is called \_\_\_\_\_.**

- A) Perimysium
- B) Epimysium
- C) Endomysium

**99. Which of the following parts of the visual pathway is 100% contralateral to the visual field (for example, information from the right visual field is being carried in the left side of the nervous system)?**

- A) Visual cortex
- B) Optic nerve
- C) Lateral geniculate nucleus of the thalamus
- D) A and C
- E) All of the above

**100. During the cross-bridge cycle, binding of ATP to myosin**

- A) increases the affinity of myosin for actin.
- B) causes actin and myosin to dissociate.
- C) Both A and B are true
- D) Neither A nor B is true