

**BMD 334 Human Physiology
Practice Final Exam
Sample 2**

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

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 is responsible for the secondary structure of proteins?**
 - A) Hydrogen bonds
 - B) Amine bonds
 - C) Peptide bonds
 - D) Kinetic bonds

- 3. Which of the following occurs in mitochondria?**
 - A) Krebs 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 allows for direct electrical and metabolic coupling of cells?**
 - 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) Frontal Lobe : Voluntary control of movement
 - B) Occipital Lobe : Vision
 - C) Basal nuclei : Inhibition of non-purposeful movements such as jerks and tremors
 - D) Brainstem : Sleep-wake cycles
 - E) Parietal Lobe : Auditory sensations

- 7. What type of gland secretes products into ducts leading to the external environment?**
 - A) Endocrine glands
 - B) Exocrine glands
 - C) Both A and B
 - D) Neither A nor B

8. **Animals whose body temperature changes with environmental temperatures, thereby not maintaining strict thermal homeostasis, are called ____.**
- A) Endotherms
 - B) Hypotherms
 - C) Hypertherms
 - D) Poikilotherms
 - E) Homeotherms
9. **Which of the following polymers is matched correctly with its subunit?**
- A) Proteins – Amino acids
 - B) DNA - Nucleotides
 - C) Glycogen - Glucose
 - D) A and C
 - E) All of the above
10. **How many amino acids are coded by a strand of mRNA with 600 nucleotides?**
- A) 600
 - B) 300
 - C) 200
 - D) 100
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. **Which of the following is NOT a nucleotide?**
- A) ATP
 - B) NAD
 - C) acetyl CoA
 - D) cAMP
13. **Covalent modulation is catalyzed by what type of enzyme?**
- A) Adenylyl cyclase
 - B) Phospholipase C
 - C) RNA polymerase
 - D) Protein kinase
 - E) All of the above
14. **Under anaerobic conditions, what is pyruvic acid converted to?**
- A) Acetyl coenzyme A
 - B) Lactic acid
 - C) Glucose
 - D) Amino acid
15. **Where are lipids synthesized?**
- A) Golgi apparatus
 - B) Rough endoplasmic reticulum
 - C) Smooth endoplasmic reticulum
 - D) Nucleus
 - E) Peroxisomes

16. **Substance X is transported out of a cell by secondary active transport with sodium. Which of the following statements is true?**
- A) Sodium moves into the cell.
 - B) This is an example of co-transport.
 - C) A and B are both true
 - D) Neither A nor B is true
17. **The height of the activation energy barrier is _____ related to the reaction rate.**
- A) directly
 - B) inversely
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. **The last electron acceptor in the electron transport chain is _____.**
- A) Cytochrome b
 - B) Coenzyme Q
 - C) Hydrogen
 - D) Oxygen
 - E) Carbon dioxide
20. **A cell is placed in a 250 mM solution of sodium chloride. What happens to the cell size?**
- A) Nothing
 - B) It swells
 - C) It shrinks
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. **Which of the following statements about the Na/K pump is FALSE?**
- A) 3 sodium ions are moved out of the cell per ATP
 - B) 1 potassium ion is moved into the cell per ATP
 - C) It is a form of primary active transport
 - D) The pumps activity is regulated through covalent modulation.
23. **Opening of potassium channels in neurons generally can result in what type of potential change?**
- A) depolarization
 - B) hyperpolarization
 - C) repolarization
 - D) A and C
 - E) B and C
24. **Which of the following is located in greater concentration inside the cell compared to outside?**
- A) Sodium ions
 - B) Potassium ions
 - C) Both A and B
 - D) Neither A nor B

25. **What endocrine gland secretes CRH?**
A) Hypothalamus
B) Anterior pituitary
C) Posterior pituitary
D) Adrenal cortex
E) Pancreas
26. **Which of the following hormones is hydrophilic?**
A) Testosterone
B) Aldosterone
C) Progesterone
D) Thyroid hormone
E) Epinephrine
27. **Which of the following types of channels can be found at inhibitory synapses?**
A) voltage-gated potassium channels
B) ligand-gated potassium channels
C) ligand-gated chloride channels
D) A and B
E) B and C
28. **The enzyme that converts ATP to cAMP is called**
A) phospholipase C.
B) adenylate cyclase.
C) myosin light chain kinase.
D) phosphatase
29. **Which class of neurons brings information from the periphery to the central nervous system?**
A) Afferents
B) Efferents
C) Interneurons
30. **Which of the following statements about refractory periods is FALSE?**
A) During the relative 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 opening of potassium channels.
C) The refractory period prevents summation of action potentials.
D) The refractory period ensures unidirectional conduction of action potentials.
31. **Which of the following would NOT be found within the gray matter of the spinal cord?**
A) Interneurons
B) Afferent neuron cell bodies
C) Efferent neuron cell bodies
D) Axon terminals from afferent neurons
32. **Which of the following reflexes is a monosynaptic reflex found in the human body?**
A) withdrawal reflex
B) crossed-extensor reflex
C) muscle spindle stretch reflex
D) pupillary light reflex
E) All of the above

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. **Translation occurs in the _____ and produces a molecule of _____.**
A) nucleus, DNA
B) nucleus, RNA
C) cytoplasm, RNA
D) cytoplasm, protein
35. **The ability of the nervous system to alter its anatomy and function in response to changes in its activity pattern is called _____.**
A) Memory
B) Declaration
C) Plasticity
D) Consolidation
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. **According to the Law of Specific Nerve Energies, we hear with our _____. ☺**
A) Eyes
B) Nose
C) Ears
D) Mouth
E) Fingers
38. **What neurotransmitter binds to NMDA receptors?**
A) Acetylcholine
B) Glycine
C) Glutamate
D) Dopamine
E) Enkephalin
39. **Sensory receptors that detect tissue damaging stimuli are called _____.**
A) Nociceptors
B) Proprioceptors
C) Pacinian corpuscles
D) Spindles
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
43. **Where is most of the ATP in cells generated?**
A) Cytosol
B) Nucleus
C) Mitochondria
D) Endoplasmic reticulum
E) Golgi apparatus
44. **Which of the following is NOT a trait of the spinothalamic tract?**
A) Second-order neurons cross over in the spinal cord
B) It carries information about pain
C) It carries information about surface temperature
D) The termination in the thalamus is ipsilateral to the side of stimulation
45. **Where is the primary somatosensory cortex?**
A) Frontal lobe
B) Parietal lobe
C) Temporal lobe
D) Occipital lobe
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 tropic hormone?**
A) Hypothalamus
B) Posterior pituitary
C) Adrenal gland
D) A and B
E) 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. **Where are the polypeptide chains of proteins to be secreted from a cell synthesized?**
A) Rough endoplasmic reticulum
B) Smooth endoplasmic reticulum
C) Ribosomes free in the cytosol
D) Nucleus
50. **In a reaction, the addition of an excess of products will cause the reaction to proceed in which direction (in the absence of end-product inhibition)?**
A) toward the product
B) toward the reactant
C) excess product will not alter the direction of the reaction

NEW MATERIAL

51. **The transduction mechanism of which of the following sensory systems does NOT involve G-proteins?**
A) Olfaction
B) Vision
C) Sweet taste
D) Hearing
52. **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
53. **What separates the outer and middle ears?**
A) Round window
B) Oval window
C) Tympanic membrane
D) Ossicles
E) Eustachian tube
54. **Receptors for olfaction are located on _____.**
A) Cilia
B) Stereocilia
C) Kinocilia
D) Microvilli
55. **If light in the center of the receptive field excites a particular ganglion cell, whereas light in the peripheral of the receptive field of that same ganglion cell inhibits the cell, then what type of ganglion cell is this?**
A) On center / Off surround
B) Off center / On surround
56. **Which of the following phases of a muscle twitch is longest?**
A) latent period
B) Contraction phase
C) Relaxation phase
57. **Which of the following contains endolymph?**
A) scala vestibuli
B) scala tympani
C) scala media
D) A and B
E) A and C
58. **Where are hair cells for hearing located?**
A) Utricle
B) Saccule
C) Cochlea
D) Nasal cavity
E) Eustachian tube

- 59. Which of the following is true of rods with respect to cones?**
- A) Rods are more sensitive to light
 - B) Rods are found in greater concentration in the fovea
 - C) Rods have greater convergence onto bipolar cells
 - D) A and C
 - E) All of the above
- 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. What second messenger system is activated in response to sucrose acting on taste receptor cells?**
- A) cAMP
 - B) cGMP
 - C) Inositol triphosphate and diacylglycerol
- 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. What spot on the retina is associated with the greatest visual acuity?**
- A) Fovea
 - B) Optic disk
 - C) Choroid
 - D) Blind spot
- 64. Soft high frequency sound waves would cause which of the following?**
- A) Small displacement of the basilar membrane near the helicotrema.
 - B) Small displacement of the basilar membrane near the oval window.
 - C) Large displacement of the basilar membrane near the helicotrema.
 - D) Large displacement of the basilar membrane near the oval 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) activation of the parasympathetic nervous system
 - B) contraction of the radial muscle of the iris.
 - C) contraction of the ciliary muscle.
 - D) A and B
 - E) A and C
- 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 have a much greater affinity for epinephrine than norepinephrine are

- A) Alpha 1
- 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. Where are most of the autonomic nervous system control centers located?

- A) Brainstem
- B) Frontal lobe
- C) Thalamus
- D) Limbic system
- E) Cerebellum

72. 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

73. Beta adrenergic receptors are associated with what second messenger system?

- A) cAMP
- B) cGMP
- C) Inositol triphosphate and diacylglycerol
- D) None of the above
- E) Could be any of the above – it depends on what G protein is affected in the target cell.

74. Which of the following best describes the function of transverse (t) tubules and the sarcoplasmic reticulum in skeletal muscle contraction?

- A) Action potentials in t tubules trigger the release of acetylcholine, which binds to receptors on the sarcoplasmic reticulum and trigger calcium release.
- B) Action potentials in t tubules trigger the release of norepinephrine, which binds to receptors on the sarcoplasmic reticulum and trigger calcium release.
- C) Action potentials in t tubules are detected by DHP receptors which are coupled to ryanodine receptors in the sarcoplasmic reticulum and open channels for calcium.
- D) Action potentials in t tubules are detected by ryanidine receptors which are coupled to DHP receptors in the sarcoplasmic reticulum and open channels for calcium.
- E) None of the above

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

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

- A) 7145324
- B) 5317624
- C) 1253764
- D) 2453716
- E) 2534617

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

- A) Slow to fatigue
- B) Large diameter fibers
- C) Low ATPase activity
- D) A and C
- E) All of the above

77. Which of the following is true of skeletal, cardiac, and smooth muscle?

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

78. Calcium binding to calmodulin causes phosphorylation of what protein in what type of muscle?

- A) Troponin in skeletal and cardiac muscle
- B) Troponin in smooth muscle only
- C) Actin in cardiac and smooth muscle
- D) Actin in smooth muscle only
- E) Myosin in smooth muscle only

79. Which of the following adaptations does NOT generally occur with aerobic exercise?

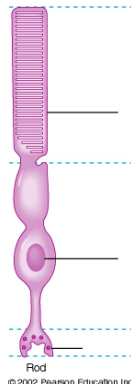
- A) An increase in the number of mitochondria per muscle fiber
- B) An increase in the number of myofibrils per muscle fiber
- C) A conversion of fast glycolytic fibers to fast oxidative fibers
- D) An increase in the blood supply to the muscles
- E) An increase in the aerobic capacity

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.

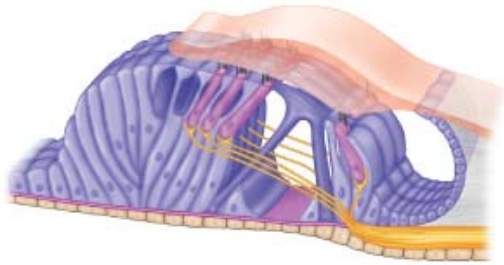
- C) A motor unit is a motor neuron and all the muscle fibers it innervates.
D) A motor unit is a muscle fiber and all motor neurons that innervate it.
- 81. Jack tries to impress Jill by bench pressing 100 pounds. However, Jack should have tried 50 pounds because he could not budge 100 pounds. Jack performed what type of muscle contraction for Jill?**
A) Isotonic
B) Isometric
- 82. Which type of receptor cells are neurons that are replaced on a regular basis?**
A) Photoreceptors
B) Hair cells for hearing
C) Hair cells of the vestibular apparatus
D) Olfactory receptors
E) Taste receptor cells
- 83. Which of the following statements about summation and tetanus is true?**
A) Summation and tetanus occur at high frequencies of skeletal muscle stimulation.
B) Summation and tetanus do NOT occur in cardiac muscle.
C) Summation and tetanus result from increases in cytosolic calcium levels.
D) A and C
E) All of the above
- 84. What type of receptor does acetylcholine bind to on the ciliary muscle of the eye?**
A) Alpha
B) Beta-1
C) Beta-2
D) Nicotinic
E) Muscarinic
- 85. Which of the following neurons is cholinergic?**
A) Motor neuron
B) Sympathetic pre-ganglionic neuron
C) Parasympathetic pre-ganglionic neuron
D) Parasympathetic post-ganglionic neuron
E) All of the above
- 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 could result in a spontaneous depolarization of a cell?**
A) Opening of potassium channels
B) Opening of sodium channels
C) Closing of calcium channels
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. True or False. In the body, most muscles are at lengths considerably less than optimum. Thus, we must stretch the muscle as much as possible prior to an activity to get the most force developed with contraction.**
- A) True
 - B) False
- 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. The size principle of motor unit recruitment states that**
- A) motor units with the larger diameter motor neurons are recruited first.
 - B) motor units with the greatest number of muscle fibers are recruited first.
 - C) motor units that innervate the smallest diameter muscle fibers are recruited first.
 - D) A and B
 - E) A and C
- 93. On termination of exercise, which of the following continues in order to replenish energy reserves in the muscle cell?**
- A) Oxidative phosphorylation
 - B) Anaerobic glycolysis
 - C) Breakdown of creatine phosphate to form ATP
 - D) A and C
 - E) All of the above
- 94. Which of the following is an incorrect match between cranial nerve and special sense?**
- A) Cranial nerve I - olfaction
 - B) Cranial nerve II - vision
 - C) Cranial nerve VII - hearing
 - D) Cranial nerve VIII - equilibrium
- 95. Identify where photopigments are located in the figure below.**



- A)
- B)
- C)

96. Identify the structure in the figure below.



- A) Utricle
- B) Olfactory mucosa
- C) Cochlea
- D) Cupula
- E) Taste bud

97. Which of the following fluids has a high concentration of potassium ions?

- A) Cerebrospinal fluid
- B) Plasma
- C) Endolymph
- D) A and C
- E) All of the above

98. Which branch of the autonomic nervous system is more active at rest?

- A) Sympathetic
- B) Parasympathetic

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 detach.
- C) Both A and B are true
- D) Neither A nor B is true

101. What dog is presented in the following picture?



- A) Buddy

102. What is a nerve?

- A) A bundle of axons in the peripheral nervous system
- B) A group of neurons with a common function
- C) An afferent neuron and all of its associated receptors
- D) A motor neuron and all the muscle fibers it innervates