

BMD 334
Practice Exam 3
Sample 1

MULTIPLE CHOICE (2 points each) Questions 1-35 must be answered on the computer form to receive credit. Choose the one best answer. For a statement to be true, all parts of the statement must be true.

1. **Neurotransmitter A binds to receptors on the post-synaptic cell opening channels for K^+ ions. Which of the following statements is correct?**
 - A) Potassium diffuses through the channel causing a hyperpolarization.
 - B) Potassium diffuses through the channel causing a depolarization.
 - C) Potassium is actively transported through the channel causing a hyperpolarization.
 - D) Potassium is actively transported through the channel causing a depolarization.
 - E) Potassium moves through the channel by osmosis.

2. **Which of the following statements is FALSE?**
 - A) Neurons of the hypothalamus release vasopressin from the posterior pituitary into the blood.
 - B) Neurons of the hypothalamus release trophic hormones into portal vessels that transport the trophic hormone to the anterior pituitary.
 - C) The hypothalamus contains the centers for establishing the circadian rhythms.
 - D) The hypothalamus receives negative feedback from anterior pituitary hormones.
 - E) The hypothalamus- anterior pituitary hormones regulate insulin secretion.

3. **At the resting membrane potential of neurons,**
 - A) permeability of the membrane for potassium is greater than for sodium.
 - B) the sodium/potassium-ATPase is not active (that is, no pumping of sodium and potassium is occurring).
 - C) the membrane potential is equal to the equilibrium potential for potassium.
 - D) A and C
 - E) All of the above

4. **Which of the following is not a characteristic of paracrines?**
 - A) Provides local communication between neighboring cells.
 - B) Moves to its target cell by diffusion.
 - C) Communicates to a cell by binding to receptors.
 - D) Is transported to the target cell in the blood.

5. **Glutamate is an excitatory amino acid neurotransmitter which produces a rapid response in the post-synaptic cell. Which of the following statements most likely describes the actions of glutamate on the post-synaptic cell?**
 - A) Glutamate will bind to receptors in the cytoplasm, altering the synthesis of proteins in the post-synaptic cell.
 - B) Glutamate will bind to receptors in the nucleus, altering transcription of DNA.
 - C) Glutamate will bind to receptors on the plasma membrane, opening potassium channels.
 - D) Glutamate will bind to receptors on the plasma membrane, opening channels for sodium and potassium.
 - E) Glutamate will bind to receptors on the plasma membrane activating a G-protein. The G-protein activates a second messenger that activates a protein kinase. The protein kinase phosphorylates a potassium channel, opening it.

6. **Which of the following classes of hormones is transported in blood bound to plasma proteins?**
- A) Steroid hormones
 - B) Peptide hormones
 - C) Catecholamines
 - D) A and C
 - E) All of the above
7. **Dr. Jones gave Mr. Smith too much morphine. Mr. Smith went into severe respiratory depression. To counter this, Dr. Jones gave Mr. Smith naloxone, which bound to the opiate receptors preventing morphine from binding to those receptors and stopping the respiratory depression, thus saving Mr. Smith's life. What type of drug is naloxone?**
- A) Opiate agonist
 - B) Opiate antagonist
8. **Which of the following characteristics describes steroid hormones?**
- A) Derived from cholesterol
 - B) Relative long half life
 - C) Binds to intracellular receptors
 - D) A and C
 - E) All of the above
9. **Which of the following is not the correct path between hypothalamic hormone, anterior pituitary hormone, and final hormone?**
- A) TSH - TRH - Thyroid hormone
 - B) CRH - ACTH - Cortisol
 - C) GHRH - GH - Somatomedins
 - D) GnRH - LH - Testosterone or Estrogen
 - E) PRH - Prolactin - none (prolactin is not a trophic hormone)
10. **Which of the following glial cells lines the cerebral ventricles?**
- A) Astrocytes
 - B) Ependymal cells
 - C) Schwann cells
 - D) Microglia
 - E) Oligodendrocytes
11. **Graded potentials**
- A) can be depolarizing or hyperpolarizing depending on the stimulus.
 - B) are limited in duration by refractory periods.
 - C) will dissipate as they spread across the cell membrane.
 - D) A and C
 - E) All of the above
12. **During which of the following phases of an action potential is permeability to sodium greater than permeability to potassium?**
- A) Depolarization
 - B) Repolarization
 - C) After-hyperpolarization
 - D) A and C
 - E) All of the above

- 13. During the absolute refractory period,**
- A) an action potential can be elicited with a suprathreshold stimulus.
 - B) sodium inactivation gates are closed.
 - C) the membrane potential is hyperpolarized.
 - D) A and C
 - E) All of the above
- 14. Which of the following statements correctly describes the endocrine system?**
- A) Long term regulation
 - B) Wired system (direct cell-to-cell communication)
 - C) Hormones are released into the blood
 - D) A and C
 - E) All of the above
- 15. Which of the following favors a faster conduction velocity of action potentials?**
- A) Larger diameter axon
 - B) Stronger stimulus
 - C) More myelin around axon
 - D) A and C
 - E) All of the above
- 16. A neuron actively transports chloride ions out of a cell. When neurotransmitter X binds to its receptors on this neuron, chloride channels open. Which of the following statements is correct?**
- A) Chloride ions diffuse into the cell.
 - B) The cell membrane is hyperpolarized.
 - C) The cell membrane is stabilized.
 - D) A and B
 - E) A and C
- 17. Acetylcholine**
- A) is the most abundant neurotransmitter in the peripheral nervous system.
 - B) is synthesized by the enzyme acetylcholinesterase.
 - C) is degraded by the enzyme choline acetyl transferase.
 - D) A and C
 - E) All of the above
- 18. Several drugs for treating depression block monoamine oxidase actions. These drugs would**
- A) increase acetylcholine levels in the brain.
 - B) decrease acetylcholine levels in the brain.
 - C) increase catecholamine levels in the brain.
 - D) decrease catecholamine levels in the brain.
 - E) None of the above
- 19. Where does most of the energy for the brain cells come from?**
- A) Aerobic catabolism of glucose supplied by the blood.
 - B) Anaerobic catabolism of glucose supplied by the blood.
 - C) Aerobic catabolism of glucose supplied from the breakdown of glycogen stores in the brain.
 - D) Anaerobic catabolism of glucose supplied from the breakdown of glycogen stores in the brain.
 - E) AAA batteries located in the hypothalamus.

20. **In lateral inhibition,**
- A) the nervous system produces contrast to emphasize important information versus less important.
 - B) afferent neurons with neighboring receptive fields inhibit each others communication to second order neurons.
 - C) the ability to locate the site of a stimulus is enhanced.
 - D) A and C
 - E) All of the above
21. **As you answer this question, you are using**
- A) reflexive memory.
 - B) declarative memory.
 - C) habituation.
 - D) sensitization.
22. **In the dorsal column - medial lemniscal pathway,**
- A) proprioception information is transmitted to the brain.
 - B) the first order neuron communicates with the second order neuron in the dorsal horn of the spinal cord.
 - C) the path crosses to the contralateral side in the brainstem.
 - D) A and C
 - E) All of the above
23. **Chemicals released from damaged tissue, such as bradykinin, can activate what type of nociceptor?**
- A) Mechanical nociceptor
 - B) Thermal nociceptor
 - C) Polymodal nociceptor
 - D) A and C
 - E) All of the above
24. **Rubbing a sore area can decrease the sensation of pain by**
- A) activating the endogenous analgesia systems.
 - B) referring the pain to another area of the body.
 - C) activating large diameter afferents that activate an inhibitory interneuron that inhibits the second-order neurons for pain.
 - D) decreasing the number of action potentials in nociceptor afferents.
 - E) pre-synaptic inhibition of substance P release.
25. **Which of the following is the correct pathway from the lateral geniculate nucleus of the thalamus to the visual cortex?**
- A) Optic Tract
 - B) Optic Radiations
 - C) Optic Nerve
 - D) Optic Chiasm
 - E) Optic Disk
26. **Where is the ratio of cones : rods greatest?**
- A) Optic disk
 - B) Fovea
 - C) Lateral areas of the retina
 - D) No where; rods and cones are evenly distributed throughout the retina

27. **The process by which receptors convert stimulus energies into neural impulses is called**
A) adaptation.
B) proprioception.
C) conversion.
D) transduction.
28. **Which of the following statements is true about the right cerebrum?**
A) It receives touch information from the left arm.
B) It receives visual information from the left visual field.
C) It is connected to the left cerebrum by the corpus callosum.
D) A and C
E) All of the above
29. **The blood brain barrier**
A) is formed by gap junctions between the endothelial cells making up the capillary walls in the brain.
B) is formed by gap junctions between astrocytes near the capillaries.
C) allows for the physiological regulation of the movement of hydrophilic substances between the blood and nervous tissue.
D) A and C
E) B and C
30. **Olfactory receptors**
A) are located on neurons in the olfactory epithelium whose axons form cranial nerve I.
B) are located on microvilli that extend into the mucus.
C) can only bind chemicals (odorants) dissolved in mucus.
D) A and C
E) All of the above
31. **Which of the following taste transduction mechanisms is incorrect?**
A) Bitter is caused by a ligand binding to a membrane receptor and activating a G-protein which increases cAMP levels. cAMP causes phosphorylation of a calcium channel. The channel is opened by phosphorylation, leading to calcium entry and exocytosis of transmitter.
B) Sour is caused by hydrogen ions binding to potassium channels, blocking the channels leading to a depolarization of the taste receptor cell.
C) Salty is caused by an increase in sodium ions outside the cell. This increases the chemical force for sodium to move into the cell. More sodium enters the cell depolarizing the cell.
D) Sweet is triggered by a ligand binding to a G-protein. cAMP is produced. cAMP causes phosphorylation of a potassium channel. The potassium channel closes, which depolarizes the receptor cell.
E) Umami is caused by glutamate binding to receptors opening cation channels allowing sodium to enter the cell depolarizing the cell.
32. **The stereocilia for hearing are exposed to**
A) endolymph in the vestibular duct.
B) perilymph in the vestibular duct.
C) endolymph in the cochlear duct.
D) perilymph in the cochlear duct.
E) endolymph in the tympanic duct.

- 33. Which of the following is the incorrect association of sensory system to pathway component?**
- A) Hearing – Cranial nerve VIII
 - B) Temperature – Spinothalamic tract
 - C) Vision – Cranial nerve III
 - D) Equilibrium – Cranial nerve VIII
 - E) All sensory systems - Thalamus
- 34. In the utricle and saccule, bending of stereocilia toward the kinocilium causes**
- A) Depolarization of hair cells for angular acceleration.
 - B) Depolarization of hair cells for linear acceleration.
 - C) Hyperpolarization of hair cells for angular acceleration.
 - D) Hyperpolarization of hair cells for linear acceleration.
 - E) Hyperpolarization of hair cells for hearing.
- 35. The parasympathetic nervous system causes**
- A) contraction of the radial muscle of the iris.
 - B) contraction of ciliary muscle.
 - C) pupillary dilation.
 - D) A and C
 - E) All of the above

PRINT answers to the following questions directly on the exam as directed.

36. (7 points) Match the following CNS regions with the appropriate function based on the key below. There is only one answer per blank, but an answer may be used more than once. Put the appropriate letter for your answer on the lines provided.

- | | | |
|------------------------|-------------------------|--------------------------|
| A. Brain Stem | B. Basal Nuclei | C. Thalamus |
| D. Hypothalamus | E. Cerebellum | F. Occipital Lobe |
| G. Frontal Lobe | H. Temporal Lobe | I. Parietal Lobe |

- _____ Relay station for all sensory input
- _____ Major link between nervous/endocrine systems
- _____ Cardiovascular and respiratory control centers located here
- _____ Main control of voluntary movement
- _____ Inhibition of muscle tone and useless movements
- _____ Vision
- _____ Sleep

37. (3 points) Name the 5 components of a reflex arc in correct order.

Stimulus

1. _____

2. _____

3. _____

4. _____

5. _____

Response

38. (2 points) Define a sensory unit (in 2 sentences or less).

What is the maximum number of different receptor TYPES that can be associated with a sensory unit?

39. (2 points) Fill in the blanks.

During synaptic communication, an action potential arrives at the synaptic terminal causing the voltage-dependent opening of _____ channels (name the ion). This ion enters the cell and triggers the release of neurotransmitter by the process called

_____.

40. (4 points) For each of the following, state whether it occurs in the “light” or “dark”.

cGMP levels are high _____

Sodium channels are open _____

Calcium channels are open _____

Transmitter is released _____

- 41. (5 points) For each of the following descriptions, state the clinical condition as accurately as possible.**

Ossicles in the ear have calcified and no longer can vibrate. _____

Hair cells in the cochlea have been damaged by exposure to loud noises. _____

During a heart attack, a person perceives pain in the left shoulder. _____

The lens in the eye has become cloudy with age. _____

The volume of aqueous humor in the anterior cavity of the eye is increased. _____

- 42. (5 points) Circle the correct answer in () or fill in the blanks.**

In the cAMP second messenger system, a chemical messenger binds to a receptor located (on the plasma membrane or in the cytoplasm). The binding of messenger to receptor activates a _____, which activates the enzyme _____ that catalyzes the conversion of ATP to cAMP in the (extracellular fluid or cytosol). cAMP activates a _____, which catalyzes the phosphorylation of a protein bringing about a response in the cell.

43. (2 points) Answer the following two questions.

What stimulates the closing of sodium inactivation gates?

What stimulates the opening of sodium inactivation gates?

BONUS (3 points)

The doctor gives a patient epidural morphine to block the patient's pain. Explain the actions morphine can have in the spinal cord to block pain transmission. Hint 1: Morphine is an opiate and will have actions similar to endogenous opiates such as enkephalins. Hint 2: Morphine can block pain transmission two different ways, both affecting communication between the first order and second order neurons.