BMD 334 Human Physiology **Name _____**
Practice Exam 2
Sample 3 **Student ID _____**

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. Which of the following electrical and chemical gradients exist at a neuron's resting membrane potential?
A) Electrical and chemical forces drive sodium ions into the cell.
B) Electrical forces drive potassium ions into the cell.
C) Chemical forces drive potassium ions out of the cell.
D) B and C
E) All of the above

2. Which of the following is likely to occur when a lipophobic messenger binds to receptors on the surface of the cell?
A) The cell membrane becomes more rigid.
B) A second messenger appears in the cytoplasm.
C) The cell becomes inactive.
D) The messenger is transported to the nucleus where it alters the transcription of DNA.

3. Which of the following is an example of negative feedback?
A) Glucagon increases blood glucose levels whereas insulin decreases blood glucose.
B) Increases in blood glucose decrease the release of insulin.
C) Oxytocin stimulates uterine contractions, which stimulates oxytocin release.
D) A and C
E) All of the above

4. When steroid hormones bind to their receptors,
A) adenylyl cyclase is activated.
B) G proteins are activated.
C) protein kinases are activated.
D) gene transcription is altered.
E) All of the above

5. Peptide hormones
A) are made as inactive preprohormones and processed to prohormones.
B) are transported dissolved in the plasma.
C) have a short half-life.
D) A and C
E) All of the above

6. Steroid hormones
A) are synthesized as they are needed.
B) are hydrophobic.
C) are transported in the blood bound to protein carriers.
D) A and C
E) All of the above

7. Which of the following statements about graded potentials is FALSE?

A) Graded potentials can sum over time.
B) Graded potentials can sum over space.
C) Graded potentials can be produced by binding of neurotransmitter to membrane receptor.
D) Receptor potentials (referring to sensory receptors) are graded potentials.
E) Refractory periods limit the duration of graded potentials.

8. Based on the diagram of an action potential below, during what phase(s) is the permeability to potassium greater than the permeability to sodium?

A) 2
B) 1, 2, 3
C) 3, 4
D) 1, 3, 4
E) 4

9. Which of the following axons would have the greatest conduction velocity?

A) diameter = 5 microns, myelinated
B) diameter = 5 microns, unmyelinated
C) diameter = 20 microns, myelinated
D) diameter = 20 microns, unmyelinated

10. The absolute refractory period is

A) due primarily to increased permeability for potassium.
B) due primarily to closing of the inactivation gates for sodium.
C) the period immediately following an action potential during which a stimulus greater than threshold is necessary to elicit another action potential.
D) A and C
E) B and C

11. Excitatory Post-Synaptic Potentials (EPSPs) are caused by

A) voltage-dependent opening of sodium channels.
B) voltage-dependent opening of calcium channels.
C) voltage-dependent closing of potassium channels.
D) receptor-mediated opening of channels for sodium and potassium.
E) receptor-mediated closing of chloride channels.

12. In neurons, action potentials occur in the

A) dendrites.
B) cell bodies.
C) axons.

13. Neurotransmitters are generally released from what part of a neuron?

A) Cell body
B) Dendrites
C) Axon terminal
D) Axon Hillock
E) Trigger zone

14. Following a car accident, a man loses the sensation of touch from his left foot due to damage of the spinal cord. The damage occurred above the level of sensory input from the foot to the spinal cord (that is, the damage is affecting tracts carrying sensory information). The sensation of pain is also lost from one foot. Which of the following statements is true?

A) The right side of the spinal cord was damaged, not the left.
B) The sensation of pain was lost from the left foot.
C) Both A and B are true
D) Neither A nor B are true

15. Cold receptors

A) respond to temperatures between 20 and 35 degrees celsius.
B) respond with an INCREASE in action potential frequency with an INCREASE in temperature.
C) Both A and B
D) Neither A nor B

16. With regards to the visual system, activation of the sympathetic nervous system causes

A) pupillary dilation.
B) pupillary constriction.
C) accomodation.
D) A and C
E) B and C

17. Which of the following occurs in the light?

A) cGMP levels increase in the outer segment.
B) Sodium channels open in the outer segment.
C) Calcium channels open in the outer segment.
D) Transmitter is released from photoreceptor terminal.
E) The photopigment dissociates.

18. Which of the following statements about the blood-brain barrier is true?

A) The blood-brain barrier is formed by tight junctions between endothelial cells forming the walls of the capillaries in the brain.
B) The blood-brain barrier is formed by tight junctions between astrocytes lining the capillaries in the brain.
C) The blood-brain barrier is a barrier to hydrophobic, but not hydrophilic, molecules.
D) A and C
E) B and C

19. Which of the following is caused by a weak lens, allowing the eye to focus far objects on the retina using accommodation and being unable to focus near objects.

A) Presbyopia
B) Myopia
C) Hyperopia
D) Emmetropia
E) Glaucoma

20. In comparison to low pitch sound, high pitch sound will cause vibrations of the basilar

membrane
A) closer to the oval window.
B) closer to the helicotrema.
C) closer to the tympanic membrane.
D) closer to the tectorial membrane.
E) of greater amplitude.

21. Damage to one of the ossicles of the middle ear could result in
A) dizziness.
B) conductive deafness.
C) sensorineural deafness.
D) central deafness.
E) cataracts.

22. The function of the cochlea is
A) sound wave amplification.
B) sound transduction.
C) detecting linear acceleration.
D) detecting angular acceleration.
E) light transduction.

23. Exocrine glands
A) secrete hormones into the blood.
B) secrete their products into ducts that lead to the external environment.
C) are effector organs for the autonomic nervous system.
D) A and C
E) B and C

24. In the vestibular apparatus, bending of the stereocilia toward the kinocilium results in
A) depolarization of the hair cell.
B) hyperpolarization of the hair cell.
C) increased frequency of action potentials on the associated afferent fiber.
D) A and C
E) B and C

25. The gaps between adjacent Schwann cells are called
A) synapses.
B) axon terminals.
C) synaptic nodes.
D) saltatory gaps.
E) nodes of Ranvier.

26. As the charge on the membrane of a typical neuron moves from –70 mV toward 0, the cell is
A) depolarizing.
B) repolarizing.
C) hyperpolarizing.
D) over-polarizing.
E) becoming inhibited.

27. Spatial summation refers to
A) electrical signals reaching neurons from outer space.

B) multiple graded potentials originating from different locations simultaneously.
C) repeated graded potentials reaching the trigger zone one after the other.
D) suprathreshold potentials triggering action potentials that are extra-large.

28. Rapidly-adapting receptors are important in detecting CHANGES in the environment.
A) TRUE
B) FALSE

29. The glial cells that function as phagocytes in the central nervous system are
A) astrocytes.
B) microglia.
C) schwann cells.
D) ependymal cells.
E) oligodendrocytes.

30. Maintaining normal potassium concentrations in the extracellular fluid is critical to the function of excitable cells. Which of the following problems would occur if potassium levels of the extracellular fluid increased (a condition called hyperkalemia)?
A) neurons are less excitable because their resting membrane potential is hyperpolarized.
B) neurons are more excitable because their resting potential is closer to threshold.
C) neurons respond more quickly to smaller graded potentials.
D) A and C
E) B and C

31. The fiber tract that connects the two cerebral hemispheres is the
A) basal nuclei.
B) suprachiasmatic nucleus.
C) corpus callosum.
D) hippocampus.
E) amygdala.

32. Fast pain, usually described as sharp and localized, is carried by
A) small, myelinated A-delta fibers.
B) large, unmyelinated A-delta fibers.
C) small, unmyelinated C fibers.
D) large, myelinated C fibers.

33. Which of the following taste sensations involves hydrogen ions physically blocking potassium leak channels?
A) Sour
B) Salty
C) Bitter
D) Sweet

34. Where are the chemoreceptors for olfaction?
A) On the olfactory microvilli.

B) On the olfactory cilia.
C) On the olfactory bulb.
D) On taste buds.
E) On the cornea

35. Movement of the cupula in the ampullae of the semicircular canals
A) stimulates hair cells allowing us to hear sound.
B) stimulates hair cells allowing us to detect angular acceleration.
C) stimulates hair cells allowing us to detect linear acceleration.
D) stimulates hair cells allowing us to be aware of our body's position in space.

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

36. (3 points) Name a trophic hormone released from the hypothalamus, the hormone in the anterior pituitary that is affected by this hormone, and the hormone from another endocrine gland that is affected by this anterior pituitary hormone.

Hypothalamus _____

Anterior Pituitary _____

Endocrine Gland _____

37. (3 points) Match the following neurotransmitters with the appropriate description from the key below. Put the appropriate letter for your answer on the lines provided.

A.	**Acetylcholine**	**B.**	**Endorphin (opiate)**	**C.**	**Dopamine**
D.	**Serotonin**	**E.**	**GABA**	**F.**	**Glutamate**

_____ Excitatory amino acid neurotransmitter

_____ Neuropeptide

_____ Catecholamine

38. (5 points) Match the following CNS regions with the appropriate function based on the key below. An answer may be used more than once. Put the appropriate letter for your answer on the lines provided.

A.	**Brain Stem**	**B.**	**Cerebellum**	**C.**	**Thalamus**
D.	**Hypothalamus**	**E.**	**Frontal Lobe**	**F.**	**Temporal Lobe**
G.	**Parietal Lobe**	**H.**	**Occipital Lobe**	**I.**	**Limbic System**

_____ Relay station for all sensory input

_____ Cardiovascular and respiratory control centers located here

_____ Learning and memory

_____ Maintenance of balance

_____ Primary visual cortex

39. (3 points) Put nervous system (or NS), endocrine system (or ES) or both in the blanks before each property. Do not consider neurohormones in determining your answers.

_____ Immediate, short duration actions

_____ Releases chemical messenger into the blood

_____ Chemical messenger binds to messenger-specific receptors on target cells

40. (3 points) Circle the word in brackets that would correctly complete the statements.

Accommodation in the normal eye is necessary for near vision. It occurs by [contraction or relaxation] of the ciliary muscle. This in turn causes [tightening or slackening] of the zonular fibers allowing the lens to be [flat or spherical].

41. (3 points) Each description below best describes one type of chemical messenger. Write the name of the appropriate messenger in the blank.

_____ The target cell is the cell that released the messenger.

_____ A neuron releases this messenger into the blood.

_____ This messenger acts on target cells in its immediate vicinity.

42. (5 points) Outline all the steps of the cAMP second messenger system, starting with binding of the extracellular messenger to receptor and ending with a response in the target cell.

43. (2 points) Name the organelle responsible for each of the following actions.

_____ Site of steroid hormone synthesis

_____ Packages peptide hormones into secretory vesicles

44. (3 points) Answer each of the questions in the problem below.

Guillain-Barre syndrome is a rare paralytic condition that strikes after a viral infection or immunization and involves damage to myelin. There is no cure, but the illness usually resolves spontaneously. In Guillain-Barre syndrome, patients can neither feel sensations nor move their muscles because the disease affects both sensory and somatic motor neurons.

Dr. McKhann studied a group of children with paralysis to determine if they had Guillain-Barre syndrome. He first performed neurological tests that showed the children could not move their muscles, but they could feel touch or a pin prick.

Do these children have damage to afferents, efferents, or both?

Dr. McKhann then performed nerve conduction tests to determine if there was a problem with myelination. He found that the rate of conduction along the children's neurons was normal, but the strength of the action potential was diminished.

Is the neural deficit in these children due to demyelination? _____

Do the children have Guillain-Barre syndrome? _____

BONUS (3 points)

The brain uses glucose as its energy source, but it does not store glycogen. From what organ can the brain get its glucose?