MEDICINE
KING SAUD UNIVERSITY

Physiology Team 436

CNS PHYSIOLOGY

MCQ'S FILE

"ALWAYS DO YOUR BEST. WHAT YOU PLANT NOW, YOU WILL HARVEST LATER ."

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Question's:

1. In a neuron with a resting membrane potential of 265mV, the distribution of which ion across the neuronal membrane represents the greatest potential electromotive force (EMF)?
A) Potassium
B) Chloride
C) Sodium
D) Calcium

2. Forced rapid breathing results in alkalization of the blood which would lead to which of the following changes in neuronal activity?
A) Decrease in neuronal activity
B) Increase in neuronal activity
C) Initial decrease followed by an increase
D) No change in neuronal activity

3. The release of neurotransmitter at a chemical synapse in the central nervous system is dependent upon which of the following?
A) Synthesis of acetylcholinesterase
B) Hyperpolarization of the synaptic terminal
C) Opening of ligand-gated ion calcium channels
D) Influx of calcium into the presynaptic terminal

4. Which of the following is best described as an elongated, encapsulated receptor found in the dermal pegs of glabrous skin and is especially abundant on lips and fingertips?
A) Merkel's disc
B) Free nerve endings
C) Meissner's corpuscle
D) Ruffini's endings

5. Pain receptors in the skin are typically classified as which of the following?
A) Encapsulated nerve endings
B) Single class of morphologically specialized receptors
C) Same type of receptor that detects position sense
D) Free nerve endings

6. Which of the following best describes an expanded tip tactile receptor found in the dermis of hairy skin that is specialized to detect continuously applied touch
sensation?
A) Free nerve endings
B) Merkel's disc
C) Pacinian corpuscle
D) Ruffini's endings

1=C 2=B 3=D 4=C 5=D 6=B

Cont.

7. Hypoventilation has which of the following effects on neuronal activity?
A) Depresses neuronal activity
B) Increases neuronal activity
C) Increases synaptic delay
D) Increases neurotransmitter release

8. Which of the following best describes the concept of specificity in sensory nerve fibers that transmit only one modality of sensation?
A) Frequency coding principle
B) Concept of specific nerve energy
C) Singularity principle
D) Labeled line principle

9. Which of the following is an encapsulated receptor found deep in the skin throughout the body as well as in fascial layers where they detect indentation of the skin (pressure) and movement across the surface (vibration)?
A) Pacinian corpuscle
B) Meissner's corpuscle
C) Free nerve endings
D) Ruffini's endings

10. Which of the following substances enhances the sensitivity of pain receptors but does not directly excite them?
A) Bradykinin
B) Serotonin
C) Potassium ions
D) Prostaglandins

11. Which of the following is an important functional parameter of pain receptors?
A) Exhibit little or no adaptation
B) Not affected by muscle tension
C) Signal only flexion at joint capsules
D) Can voluntarily be inhibited

12. The excitatory or inhibitory action of a neurotransmitter is determined by which of the following?
A) Function of its postsynaptic receptor
B) Molecular composition
C) Shape of the synaptic vesicle in which it is contained
D) Distance between the pre- and post-synaptic membranes

A=7 D=8 A=6 D=10 A=11 A=12

Cont.

13. Which of the following statements concerning the transmission of pain signals into the central nervous system is correct?
A) The "fast" pain fibers that conduct at about 6 to 30 m/sec are classified as type C fibers.
B) Type A-delta pain fibers are responsible for the localization of a pain stimulus.
C) Upon entering the spinal cord dorsal horn, the fast and slow pain fibers synapse with the same populations of neurons.
D) The paleospinothalamic tract is specialized to rapidly conduct pain signals to the thalamus.

14. Which of the following is the system that transmits somatosensory information with the highest degree of temporal and spatial fidelity?
A) Anterolateral system
B) Dorsal column–medial lemniscal system
C) Corticospinal system
D) Spinocerebellar system

15. Which of the following pathways crosses in the ventral white commissure of the spinal cord within a few segments of entry and then courses to the thalamus contralateral to the side of the body from which the signal originated?
A) Anterolateral system
B) Dorsal column–medial lemniscal system
C) Corticospinal system
D) Spinocerebellar system

16. Which of the following statements concerning the mechanoreceptive receptor potential is/are true?
A) Increase in stimulus energy results in an increase in receptor potential.
B) When receptor potential rises above a certain threshold action potentials will appear in the neuron attached the receptor.
C) Number of action potentials generated in the neuron attached to the receptor is proportional to receptor potential.
D) All of the above are correct.

17. In chemical synapses that involve a so-called second messenger, typically a G-protein linked to the postsynaptic receptor is activated when neurotransmitter binds to that receptor. Which of the following represents an activity performed by the activated second messenger?
A) Closure of a membrane channel for sodium or potassium.
B) Activation of cyclic AMP or cyclic GMP.
C) Inactivation of enzymes that initiate biochemical reactions in the postsynaptic neuron.
D) Inactivation of gene transcription in the postsynaptic neuron.

18. Neurons located in which of the following areas release serotonin as their neurotransmitter?
A) Periaqueductal gray area
B) Interneurons of the spinal cord
C) Periventricular area
D) Nucleus raphe magnus

13=B 14=B 15=A 16=D 17=B 18=D

Cont.

19. Which of the following systems conveys information concerning highly localized touch sensation and body position (proprioceptive) sensation?
A) Anterolateral system
B) Dorsal column–medial lemniscal system
C) Corticospinal
D) Spinocerebellar

20. Which of the following explains why individuals in severe pain have difficulty sleeping without sedative medication?
A) The somatosensory cortical area for pain perception blocks the sleep-generating circuits
B) Pain fibers entering the dorsal horn and the ascending pain pathways block the sleep-generating circuits
C) Ascending pain pathways provide excitatory input to brainstem reticular formation areas that are involved in maintenance of the alert, waking state
D) The neurotransmitters used in the slow pain pathway
diffuse to neighboring cell groups and generally raise the excitability of the brain

21. The first-order (primary afferent) cell bodies of the dorsal column–medial lemniscal system are found in which of the following structures?
A) Spinal cord dorsal horn
B) Spinal cord ventral horn
C) Dorsal root ganglia
D) Nucleus cuneatus

22. Which of the following structures carries axons from the nucleus gracilis to the thalamus?
A) Fasciculus gracilis
B) Fasciculus lemniscus
C) Lateral spinothalamic tract
D) Medial lemniscus

23. Which of the following represents the basis for transduction of a sensory stimulus into nerve impulses?
A) Change in the ion permeability of the receptor membrane
B) Generation of an action potential
C) Inactivation of a G-protein–mediated response
D) Protein synthesis

24. Which of the following structures carries axons from neurons in the ventral posterolateral nucleus of the thalamus to the primary somatosensory cortex?
A) Medial lemniscus
B) External capsule
C) Internal capsule
D) Extreme capsule

C=24 A=23 D=22 C=21 C=20 B=19

Cont.

25. Which of the following is characteristic of the events occurring at an excitatory synapse?
A) There is a massive efflux of calcium from the presynaptic terminal
B) Synaptic vesicles bind to the postsynaptic membrane
C) Voltage-gated potassium channels are closed
D) Ligand-gated channels are opened to allow sodium entry into the postsynaptic neuron

26. In a neuron with a resting membrane potential of 265mV, the distribution of which ion across the neuronal membrane represents the least potential electromotive force (EMF)?
A) Potassium
B) Chloride
C) Sodium
D) Calcium

27. Stimulation of which brain area can modulate the sensation of pain?
A) Superior olivary complex
B) Locus ceruleus
C) Periaquaductal gray
D) Amygdala

28. Which of the following body parts is represented superiorly and medially within the postcentral gyrus?
A) Upper limb
B) Lower limb
C) Abdomen
D) Genitalia

29. Which of the following is a group of neurons in the pain suppression pathway that utilizes enkephalin as a neurotransmitter?
A) Postcentral gyrus
B) Nucleus raphe magnus
C) Periaqueductal gray
D) Type AB sensory fibers

30. As the receptor potential rises higher above threshold, which of the following best characterizes the new frequency of action potentials?
A) Decrease
B) Increase
C) Remain unchanged
D) Increase only when the receptor potential increases to twice the level of threshold

25=D 26=B 27=C 28=B 29=B 30=B

Cont.

31. Which of the following is a type of interneuron in this region that utilizes enkephalin to inhibit pain transmission?
A) Nucleus raphe magnus
B) Postcentral gyrus
C) Dorsal horn of spinal cord
D) Type C sensory fiber

32. The highest degree of pain localization comes from
A) simultaneous stimulation of free nerve endings and tactile fibers
B) stimulation of free nerve endings by bradykinin
C) nerve fibers traveling to the thalamus by way of the paleospinothalamic tract
D) stimulation of type A delta fibers

33. Inhibition of pain signals by tactile stimulation of a skin surface involves which of the following selections?
A) Type A alpha fibers in peripheral nerves
B) Type A beta fibers in peripheral nerves
C) Type A delta fibers in peripheral nerves
D) Type C fibers in peripheral nerves

34. Within the primary somatosensory cortex, the various parts of the contralateral body surface are represented in areas of varying size that reflect which of the following?
A) The relative size of the body parts
B) The density of the specialized peripheral receptors
C) The size of the muscles in that body part
D) The conduction velocity of the primary afferent fibers

35. The gray matter of the primary somatosensory cortex contains six layers of cells. Which of the following layers receives the bulk of incoming signals from the somatosensory nuclei of the thalamus?
A) Layer I
B) Layers II and III
C) Layer III only
D) Layer IV

36. Which of the following statements concerning the neuronal membrane at rest is correct?
A) The extracellular sodium concentration is less than its intracellular concentration
B) The concentration of chloride is greatest inside the cell
C) If the resting potential is moved to a more negative value, the cell becomes more excitable
D) The concentration gradient for potassium is such that it tends to move out of the cell

31=C 32=A 33=B 34=B 35=D 36=D

Cont.

37. Which of the following is the basis for referred pain?
A) Visceral pain signals and pain signals from the skin synapse with separate populations of neurons in the dorsal horn
B) Visceral pain transmission and pain transmission from the skin is received by a common set of neurons in the thalamus
C) Visceral pain signals are rarely of sufficient magnitude to exceed the threshold of activation of dorsal horn neurons
D) Some visceral pain signals and pain signals from the skin provide convergent input to a common set of neurons in the dorsal horn

38. Post-tetanic facilitation is thought to be the result of
A) opening voltage-gated sodium channels
B) opening transmitter gated potassium channels
C) a buildup of calcium in the presynaptic terminal
D) electrotonic conduction

39. Pain from the stomach is referred to which area of the body?
A) upper right shoulder area
B) abdominal area above the umbilicus
C) proximal area of the anterior and inner thigh
D) abdominal area below the umbilicus

40. Which one of the following statements concerning visceral pain signals is correct?
A) They are transmitted along sensory fibers that course mainly with sympathetic nerves in the abdomen and thorax
B) They are not stimulated by ischemia in visceral organs
C) They are transmitted only by the lightly myelinated type A delta sensory fibers
D) They are typically well localized

41. Which disorder is characterized by **excessive pain** in a skin dermatomal distribution resulting from a viral infection of a dorsal root ganglion?
A) Tic douloureux
B) Thalamic pain syndrome
C) Brown-Séquard syndrome
D) Herpes zoster

42. Which disorder involves a **loss of pain sensation** on one side of the body coupled with the loss of proprioception, precise tactile localization, and vibratory sensations on the contralateral side of the body?
A) Herpes zoster
B) Thalamic pain syndrome
C) Lateral medullary syndrome
D) Brown-Séquard syndrome

37=D 38=C 39=B 40=A 41=D 42=D

Cont.

43. Which disorder is characterized by the **loss of pain sensation** throughout one entire side of the body and the opposite side of the face?
A) Brown-Séquard syndrome
B) Thalamic pain syndrome
C) Herpes zoster
D) Lateral medullary syndrome

44. Which of the following electrical events is characteristic of inhibitory synaptic interactions?
A) A neurotransmitter agent that selectively opens ligand-gated chloride channels is the basis for an inhibitory postsynaptic potential
B) Because the Nernst potential for chloride is about 270 mV, chloride ions tend to move out of the cell along its electrochemical gradient
C) A neurotransmitter that selectively opens potassium channels will allow potassium to move into the cell
D) An increase in the extracellular sodium concentration usually leads directly to an inhibitory postsynaptic potential

45. Which of the following somatosensory deficits is **NOT** typically seen following lesions that involve the postcentral gyrus?
A) Inability to discretely localize touch sensation over the contralateral face and upper limb.
B) Inability to judge the weight of easily recognizable objects
C) Inability to accurately assess the texture of common objects by touching them with the fingers
D) Inability to move the contralateral arm and leg

46. The ability to detect two points simultaneously applied to the skin is based on which of the following physiologic mechanisms?
A) Presynaptic inhibition
B) Lateral inhibition
C) Medial inhibition
D) Feed-forward inhibition

47. Stimulation by touching or pulling on which of the following structures is least likely to cause a painful sensation?
A) The postcentral gyrus
B) The dura overlying the postcentral gyrus
C) Branches of the middle meningeal artery that lie superficial to the dura over the postcentral gyrus
D) Branches of the middle cerebral artery that supply the postcentral gyrus

48. Vibratory sensation is dependent on the detection of rapidly changing, repetitive sensations. The highfrequency end of the repetitive stimulation scale is detected by which of the following?
A) Merkel's discs
B) Meissner's corpuscles
C) Pacinian corpuscles
D) Free nerve endings

43=D 44=A 45=D 46=B 47=A 48=C

Cont.

49. Prolonged changes in neuronal activity are usually achieved through the activation of
A) voltage-gated chloride channels
B) transmitter-gated sodium channels
C) G-protein–coupled channels
D) voltage-gated potassium channels

50. Transmission of the electrical signal from the dendrites to the soma of a neuron occurs by which of the following?
A) Short-circuit current flow
B) An action potential mechanism
C) Electrotonic conduction
D) Capacitive discharge

51. Which one of the following statements concerning sensory neurons or their functional properties is true?
A) All sensory fibers are unmyelinated
B) In spatial summation, increasing signal strength is transmitted by using progressively greater numbers of sensory fibers
C) Increased stimulus intensity is signaled by a progressive decrease in the receptor potential
D) Continuous subthreshold stimulation of a pool of sensory neurons results in disfacilitation of those neurons
E) Temporal summation involves signaling of increased stimulus strength by decreasing the frequency of action potentials in the sensory fibers

52. For a sensory nerve fiber that is connected to a Pacinian corpuscle located on palmar surface of the right hand, the synaptic connection with the subsequent neuron in the corresponding sensory pathway is located in
A) the right dorsal column nucleus
B) the left dorsal column nucleus
C) the dorsal horn of the right side of the spinal cord
D) the dorsal horn of the left side of the spinal cord

53. Migraine headaches typically begin with a prodromal symptom such as nausea, loss of vision, visual aura, or other sensory hallucinations. Which of the following is thought to be the cause of such prodromes?

A) Increased blood flow to brain tissue in the visual or other sensory cortex
B) A selective loss of GABA neurons in the various sensory areas of cortex
C) Constipation
D) Vasospasm leading to ischemia and a disruption of neuronal activity in the relevant sensory areas of cortex

54. Which statement concerning the generation of an action potential is correct?
A) When the membrane potential in the soma/axon hillock dips below "threshold," an action potential is initiated
B) The action potential is initiated in synaptic boutons
C) The least number of voltage-gated sodium channels in an axon is found near the node of Ranvier
D) Once an action potential is initiated, it will always run its course to completion

49=C 50=C 51=B 52=A 53=D 54=D

Cont.

55. Position sense, or more commonly proprioceptive sensation, involves muscle spindles and which of the following selections?
A) Skin tactile receptors
B) Deep receptors in joint capsules
C) Both tactile and joint capsule receptors
D) Pacinian corpuscles

56. The sensation of temperature is signaled mainly by warm and cold receptors whose sensory fibers travel in association with the sensory fibers carrying pain signals. Which of the following statements best characterizes the transmission of signals from warm receptors?
A) Warm receptors are well characterized histologically.
B) Signals from warm receptors are mainly transmitted along slow-conducting type C sensory fibers.
C) Warm receptors are located well below the surface of the skin in the subcutaneous connective tissue.
D) There are 3 to 10 times more warm receptors than cold receptors in most areas of the body.

57. Like other sensory systems, the somatosensory system has a descending component that functions to regulate the overall sensitivity of the system. Which of the following selections best describes the function of the corticofugal signals transmitted from the somatosensory cortex
downward to the thalamus and dorsal column nuclei?
A) Increase or decrease the perception of signal intensity
B) Decrease the ability to detect body position sense
C) Remove the thalamus from the processing of somatosensory signals
D) Allow ascending information to bypass nucleus cuneatus and gracilis

58. Which of the following statements accurately describes a feature of temperature sensation by the nervous system?
A) Cold receptors continue to be activated even if skin temperature is lowered well below its freezing point.
B) Both cold and warm receptors each have very specific, nonoverlapping ranges of temperature sensitivity.
C) Warm and cold receptors respond to both steady state temperatures and to changes in temperature.
D) Temperature receptor function is the result of ion conduction changes and not changes in their metabolic rate.

59. Which of the following statements concerning synaptic transmission is correct?
A) When a specific population of synaptic terminals is spread over the considerable surface of a neuron, their collective effects cannot spatially summate and lead to initiation of an action potential.
B) Even if the successive discharges of an excitatory synapse occur sufficiently close in time, they cannot temporally summate and initiate an action potential.
C) A neuron is "facilitated" when its membrane potential is moved in the less negative or depolarizing direction.
D) Even when rapidly stimulated by excitatory synaptic input for a prolonged period of time, neurons typically do not exhibit synaptic fatigue.

C=59 C=58 A=57 B=56 C=55

Cont.

60. Which of the following statements regarding the processing of sensory signals by a pool of neurons is correct?
A) Convergence of input signals to individual neurons in the pool, each of which contributes to the same output channel, can lead to amplification of the signal.
B) Divergence of input signals to multiple neurons in the pool, each of which leads to a different output channel, can lead to diffusion of the signal.
C) The combination of multiple input signals from multiple sources onto a single neuron in the pool is an example of divergence.
D) The distribution of multiple input signals from a single source onto many neurons in the pool is an example of convergence.

61. Which of the following statements regarding the lateral geniculate nucleus is correct?
A) Layer one is called a parvocellular layer
B) Layer one receives signals from the lateral half of the retina
C) Layer one receives signals that originate from rods
D) Layer four receives signals from the ipsilateral retina
E) Layer four receives signals from Y ganglion cells

62. Which of the following substances will elicit the sensation of sour taste?
A) Aldehydes
B) Alkaloids
C) Amino acids
D) Hydrogen ions
E) Ketones

63. Which of the following statements regarding the refraction of light is correct?
A) Light waves have a longer wavelength in transparent solids than in air
B) Light waves travel at higher velocity through transparent solids than through air
C) The refractive index of a transparent solid is the ratio of the velocity of light in air to the velocity of light in the substance
D) The refractive index of air is zero
E) When light waves strike a transparent solid, they always reflect away from the solid rather than travel through the solid

64. When comparing the fovea with the periphery of the retina, which of the following statements is correct?
A) The fovea contains an increased proportion of cones
B) The fovea contains an increased proportion of ganglion cells
C) The fovea contains an increased proportion of horizontal cells
D) The fovea contains an increased proportion of rods
E) The fovea contains an increased proportion of vasculature

65. Which of the following is the middle ear ossicle that is attached to the tympanic membrane?
A) Columella
B) Incus
C) Malleus
D) Modiolus
E) Stapes

C=65 A=64 C=63 D=62 C=61 D=60

Cont.

66. Light entering the eye passes through which retinal layer first?
A) Inner nuclear layer
B) Outer nuclear layer
C) Outer plexiform layer
D) Photoreceptor layer
E) Retinal ganglion layer

67. Ganglion cells attached to photoreceptors located on the temporal portion of the retina project to which of the following structures?
A) Contralateral lateral geniculate nucleus
B) Ipsilateral lateral geniculate nucleus
C) Ipsilateral medial geniculate nucleus
D) Calcarine fissure
E) Contralateral medial geniculate nucleus

68. Which of the following best describes the "blind spot" of the eye?
A) Located 5 degrees lateral to the central point of vision
B) Exit point of the optic nerve
C) Contains only rods and thus has monochromatic vision
D) Contains no blood vessels
E) Area where chromatic aberration of the lens is the greatest

69. When parallel light rays pass through a concave lens, which of the following will occur?
A) Rays converge toward each other
B) Rays diverge away from each other
C) They maintain parallel relationship
D) They reflect back in the direction from where they came
E) Rays refract to one focal point

70. Which of the following regarding the attenuation reflex is correct?
A) Can increase the intensity of low-frequency sound transmission by 30 to 40 decibels
B) Increases the rigidity of the ossicular system, thereby reducing conduction of low-frequency sounds
C) Masks high-frequency sounds in a loud environment so lower frequency sounds are more easily heard
D) Occurs following a latent period of 4 to 8 seconds after the loud sound
E) Protects the cochlea from the damaging vibrations of relatively quiet but high-frequency sounds

71. Which of the following substances will elicit the sensation of bitter taste?
A) Aldehydes
B) Alkaloids
C) Amino acids
D) Hydrogen ions
E) Ketones

72. Damage to the VIth cranial nerve will produce which of the following deficits in eye movement?
A) Inability to move the eyes in a vertical up and down motion
B) Inability to rotate the eyes within the eye socket
C) Inability to move the eyes laterally towards the midline
D) Inability to move the eyes laterally away from the midline
E) Vertical strabismus

72=D 71=B 70=B 69=B 68=B 67=B E=99

Cont.

73. Which of the following statements is correct regarding the focal length of a convex lens?
A) Converging light rays passing through a convex lens will converge at a focal point farther away than the focal length of that lens
B) Diverging light rays passing through a convex lens will converge at a focal point closer than the focal length of that lens
C) Parallel light rays passing through a convex lens will converge at a focal point equal to the focal length of that lens
D) The image produced by a convex lens is right side up, but its two lateral sides are reversed with respect to the object
E) The lens with the greatest convexity will have the longest focal length

74. If a convex lens has a focal length of 1 cm (0.01 m), what is the refractive power of that lens in diopters?
A) 10.01
B) 10.10
C) 11
D) 110
E) 1100

75. The condition of cataracts is usually the result of which of the following processes or conditions?
A) Denaturation of the proteins in lens of the eye
B) Elongated eye globe
C) Unresponsive and dilated pupil
D) Coagulation of the proteins in the lens of the eye
E) Increase in intraocular pressure

76. Which of the following taste sensations is the most sensitive (i.e., has the lowest stimulation threshold)?
A) Acid
B) Bitter
C) Salty
D) Sour
E) Sweet

77. Which of the following statements regarding the basilar membrane is correct?
A) Vibrates best at high frequency near the base of the cochlea, whereas it vibrates best at low frequency at the apex of the cochlea
B) Spiral ganglion lies on its surface
C) Contains basilar fibers whose diameter increases from the base of the cochlea to the apex of the cochlea
D) Contains basilar fibers whose length decreases from the base of the cochlea to the apex of the cochlea
E) Separates the scala media from the scala vestibule

78. Which of the following substances is responsible for the umami taste sensation?
A) Acetic acid
B) Potassium tartrate
C) Long-chained organic substances containing nitrogen
D) Fructose
E) Glutamate

73=C 74=E 75=D 76=B 77=A 78=E

Cont.

79. Analysis of visual detail occurs in which secondary visual area?
A) Brodmann's area 18
B) Inferior ventral and medial regions of the occipital and temporal cortex
C) Frontal lobe
D) Occipitoparietal cortex
E) Posterior midtemporal area

80. Which of the following statements best describes the role of melanin in the pigment layer of the retina?
A) Precursor of the light sensitive chemical rhodopsin
B) Serves as nutritional component for the rods and cones in the retina
C) Dark pigment that prevents the reflection of light inside the globe of the eye
D) Responsible for maintaining integrity of the canal of Schlemm
E) Light reflected off the melanin pigment is a key element used in the process of accommodation of the lens

81. Which of the following pairs of molecules combine to form rhodopsin?
A) Bathorhodopsin and 11-cis-retinal
B) Bathorhodopsin and all-trans-retinal
C) Bathorhodopsin and scotopsin
D) Scotopsin and 11-cis-retinal
E) Scotopsin and all-trans-retinal

82. A deficiency of which vitamin prevents the formation of an adequate quantity of retinal, eventually leading to night blindness?
A) Vitamin A
B) Vitamin C
C) Vitamin D
D) Vitamin E
E) Vitamin K

83. What is the name of the condition whereby the lens of the eye becomes almost totally unaccommodating in persons over 70 years of age?
A) Amblyopia
B) Emmetropia
C) Hyperopia
D) Myopia
E) Presbyopia

84. Which compartment of the cochlea contains the organ of Corti?
A) Ampulla
B) Saccule
C) Scala media
D) Scala tympani
E) Scala vestibule

79=B 80=C 81=D 82=A 83=E 84=C

Cont.

85. Which of the following statements regarding the transmission of taste information from the tongue to the cerebral cortex is correct?
A) Majority of thalamic neurons in taste pathway synapse in the occipital lobe
B) Nerve fibers carrying taste information from the tongue have no synapse in the brainstem
C) Nerve fibers carrying taste information from the tongue synapse in the solitary nucleus
D) Thalamic nucleus involved in the taste pathway is the dorsal medial nucleus
E) Thalamic nucleus involved in the taste pathway is the ventral posterolateral nucleus

86. Which cells in layer IV of the primary visual cortex detect orientation of lines and borders?
A) Border cells
B) Complex cells
C) Ganglion cells
D) Hypercomplex cells
E) Simple cells

87. Which of the following best describes when the transmission of sound waves in the cochlea occurs?
A) When the foot of the stapes moves inward against the oval window and the round window bulges outward
B) When the foot of the stapes moves inward against the round window and the oval window bulges outward
C) When the head of the malleus moves inward against the oval window and the round window bulges outward
D) It occurs when the incus moves inward against the oval window and the round window bulges outward
E) It occurs when the incus moves inward against the round window and the oval window bulges outward

88. Under low or reduced light conditions, which of the following chemical compounds is responsible for the inward-directed sodium current in the outer segments of the photoreceptors?
A) Metarhodopsin II
B) Cyclic GMP
C) 11-cis retinal
D) Cyclic AMP
E) 11-trans retinol

89. Which of the following statements regarding the cranial nerve innervation of the tongue is correct?
A) Taste information from the anterior two-thirds of the tongue is transmitted to the solitary nucleus by the glossopharyngeal nerve
B) Taste information from the pharynx is transmitted to the solitary nucleus by the facial nerve
C) Taste information from the posterior third of the tongue is transmitted to the solitary nucleus by the glossopharyngeal nerve
D) Taste information from the posterior third of the tongue initially travels with the lingual nerve
E) Taste information from the posterior third of the tongue initially travels with the chorda tympani nerve

90. Olfactory receptor cells belong to which of the following groups of cells?
A) Bipolar neurons
B) Fibroblasts
C) Modified epithelial cells
D) Multipolar neurons
E) Pseudounipolar neurons

A=90 C=89 B=88 A=87 E=86 C=85

Cont.

91. Which of the following statements regarding hair cells is correct?
A) Hair cells depolarize when their stereocilia are bent toward the shortest stereocilium
B) Nerve fibers stimulated by hair cells have their cell bodies in the cochlear nuclei of the brainstem
C) The stereocilia of the hair cells are longer on the side of the hair cell nearest the modiolus
D) There are more inner hair cells than outer hair cells in the organ of Corti
E) Transmission of auditory signals is performed mainly by inner hair cells rather than outer hair cells

92. Accommodation for far vision (focusing on an object at a distance) requires which of the following processes?
A) Constriction of the pupil of the eye
B) Dilation of the pupil of the eye
C) An increase in the formation of rhodopsin
D) Causing the lens of the eye to have more curvature (making it fatter)
E) Causing the lens of the eye to have less curvature (making it thinner)

93. Which of the following events occurs in photoreceptors during phototransduction in response to light?
A) Phosphodiesterase activity decreases
B) Transducin activity decreases
C) Hydrolysis of cGMP increases
D) Neurotransmitter release increases
E) Number of open voltage–gated calcium channels increases

94. During photoreception, all of the following increase except
A) cGMP phosphodiesterase
B) Transducin
C) cAMP
D) Metarhodopsin II
E) Sodium influx into the outer segment of the rod

95. Which of the following statements is correct regarding astigmatism?
A) Light rays do not come to a common focal point
B) Light rays being emitted from distant objects are focused behind the retina
C) Light rays being emitted from distant objects are focused in front of the retina
D) Light rays being emitted from distant objects are in sharp focus on the retina
E) There is a cloudy or opaque area or areas in the lens

96. The stereocilia of hair cells are embedded in which membrane?
A) Basilar
B) Reissner's
C) Tectorial
D) Tympanic
E) Vestibular

C=96 A=95 E=94 C=93 E=92 E=91

Cont.

97. Which of the following cranial nerves is correctly paired with the extraocular muscle it innervates?
A) Abducens nerve–medial rectus
B) Oculomotor nerve–inferior oblique
C) Oculomotor nerve–lateral rectus
D) Oculomotor nerve–superior oblique
E) Trochlear nerve–superior rectus

98. After olfactory receptor cells bind odor molecules, a sequence of intracellular events occurs that culminates in the entrance of specific ions that depolarize the olfactory receptor cell. Which of the following ions are involved?
A) Calcium ions
B) Chloride ions
C) Hydrogen ions
D) Potassium ions
E) Sodium ions

99. For the eye to adapt to intense light, which of the following may occur?
A) Bipolar cells will continuously transmit signals at the maximum rate possible
B) Photochemicals in both rods and cones will be reduced to retinal and opsins
C) The levels of rhodopsin will be very high
D) There will be an increase in the size of the pupil
E) Vitamin A will convert into retinal

100. The condition of myopia is usually corrected by which of the following types of lens?
A) Compound lens
B) Convex lens
C) Spherical lens
D) Concave lens
E) Cylindrical lens

101. Which lobe of the cerebral cortex contains the small bilateral cortical area that controls voluntary fixation movements?
A) Frontal
B) Limbic
C) Occipital
D) Parietal
E) Temporal

102. Which of the following sensory systems has the smallest range of intensity discrimination?
A) Auditory
B) Gustatory
C) Olfactory
D) Somatosensory
E) Visual

103. Which of the following molecules moves from the endolymph into the stereocilia and depolarizes the hair cell?
A) Calcium ions
B) Chloride ions
C) Hydrogen ions
D) Potassium ions
E) Sodium ions

97=B 98=E 99=B 100=D 101=A 102=C 103=D

Cont.

104. Which of the following events prompts the auditory system to interpret a sound as loud?
A) Decreased number of inner hair cells become stimulated
B) Decreased number of outer hair cells become stimulated
C) Hair cells excite nerve endings at a diminished rate
D) Amplitude of vibration of the basilar membrane decreases
E) Amplitude of vibration of the basilar membrane increases

105. Which of the following statements is correct concerning the elements of the retina?
A) Total number of cones in the retina is much greater than the total number of rods
B) Each individual cone responds to all wave lengths of light
C) Photoreceptors activation (rods and cones) results in hyperpolarization of the receptor
D) Central fovea contains only rods
E) Pigment layer of the retina contains the photoreceptors

106. The condition of hyperopia is usually caused by which of the following anomalies of the eye?
A) Decreased production of melanin
B) Uneven curvature of the cornea
C) Eyeball that is shorter than normal
D) Eyeball that is longer than normal
E) Lens system that is too powerful and focuses the object in front of the retina

107. In the central auditory pathway which of the following represents the correct sequence of structures in the pathway?
A) Cochlear nuclei–superior olive–inferior colliculus via the lateral lemniscus - medial geniculate–auditory cortex
B) Cochlear nuclei–inferior olive–inferior colliculus via the medial lemniscus - medial geniculate–auditory cortex
C) Cochlear nuclei–superior olive–superior colliculus via the lateral lemniscus - lateral geniculate–auditory cortex
D) Cochlear nuclei–inferior olive–inferior colliculus via the lateral lemniscus - lateral geniculate–auditory cortex
E) Cochlear nuclei–trapezoid body–dorsal acoustic stria–inferior colliculus via the lateral lemniscus–medial geniculate–auditory cortex

108. Which of the following statements regarding the transmission of auditory information from the ear to the cerebral cortex is correct?
A) Inferior colliculus neurons synapse in the cochlear nuclei of the brainstem
B) Neurons with cell bodies in the spiral ganglion of Corti synapse in the inferior colliculus
C) The majority of neurons from the cochlear nuclei synapse in the contralateral superior olivary nucleus
D) There is no crossing-over of information between the right and left auditory pathways in the brainstem
E) Trapezoid neurons synapse in the cochlear nuclei of the brainstem

C=108 A=107 D=106 C=105 E=104

Cont.

109. Which of the following statements regarding color vision is correct?
A) Green is perceived when only green cones are stimulated
B) The stimulation ratio of the three types of cones allows specific color perception
C) The wavelength of light corresponding to white is shorter than that corresponding to blue
D) When there is no stimulation of red, green, or blue cones, there will be the sensation of seeing white
E) Yellow is perceived when green and blue cones are stimulated equally

110. The function of the round window can best be described by which of the following?
A) Provides the connection point for the stapes
B) Serves to damp out low frequency sounds such as your own voice
C) Transmits the frequency information into the cochlea from the tympanic membrane
D) Serves as the pressure relief valve for the cochlea
E) Transmits amplitude information into the cochlea from the tympanic membrane

111. Which of the following muscles is contracted as part of the pupillary light reflex?
A) Ciliary muscle
B) Pupillary dilator muscle
C) Pupillary sphincter muscle
D) Radial fibers of the iris
E) Superior oblique muscle

112. Which of the following allows the visual apparatus to accurately determine the distance of an object from the eye (depth perception)?
A) Monocular vision
B) Location of the retinal image on the retina
C) Phenomenon of stationary parallax
D) Phenomenon of stereopsis
E) Size of the retinal image if the object is of unknown size

113. Which of the following is the most common cause of glaucoma?
A) Drugs that reduce the secretion of aqueous humor.
B) Increased resistance to fluid outflow through trabecular spaces into the canal of Schlemm.
C) Normal function of phagocytes on the surface of trabeculae.
D) Phagocytoses of proteins and small particles by the epithelium of the iris.
E) The activation of reticuloendothelial cells in the interstitial gel outside the canal of Schlemm.

B=109 D=110 C=111 D=112 B=113

Cont.

114. Which of the following statements regarding the two types of deafness is correct?
A) An audiogram of a person with conduction deafness would show much greater loss for air conduction than bone conduction of sound.
B) An audiogram of a person with nerve deafness would show much greater loss for bone conduction than air conduction of sound.
C) Conduction deafness occurs when the cochlea or cochlear nerve is impaired.
D) Nerve deafness occurs when the physical structures that conduct the sound into the cochlea are impaired.
E) Prolonged exposure to very loud sounds is more likely to cause deafness for high-frequency sounds than low frequency sounds.

115. Consider the situation in which an individual is turning their head to the left about the axis of the neck. The motion begins while the chin is directly over the right shoulder and ends with the chin directly over the left shoulder. Which of the following best describes the eye movements associated with this type of head rotation in a normal individual?
A) While the head is turning, the eyes will be moving to the right and saccadic eye motion will be to the left
B) While the head is turning, the eyes will be moving in the same direction as the head rotation and the saccadic eye motion will be to the left
C) While the head is turning, the eyes will be moving to the right and the saccadic eye motion will be to the right
D) While the head is turning, the eyes will remain stationary within the orbits and the saccadic eye motion will be to the right
E) While the head is turning, the eyes will be moving to the left and the saccadic eye motion will be to the right

116. Horner syndrome occurs when sympathetic nerve fibers to the eye are interrupted, leading to which of the following symptoms on the affected side of the face?
A) Blood vessels of the face become persistently constricted
B) Profuse sweating occurs
C) The superior eyelid is maintained in an open position
D) There is an overproduction of lacrimal gland fluid
E) There is persistent constriction of the pupil to a smaller diameter than the pupil of the opposite eye

117. Which of the following neurotransmitters is released by both rods and cones at their synapses with bipolar cells?
A) Acetylcholine
B) Dopamine
C) Glutamate
D) Glycine
E) Serotonin

118. Olfactory information transmitted to the orbitofrontal cortex passes through which thalamic nucleus?
A) Dorsomedial
B) Lateral geniculate
C) Medial geniculate
D) Ventral posterolateral
E) Ventral posteromedial

A=114 A=115 E=116 C=117 A=118

Cont.

119. Which of the following provides about two thirds of the 59 diopters of refractive power of the eye?
A) Anterior surface of the cornea
B) Anterior surface of the lens
C) Iris
D) Posterior surface of the cornea
E) Posterior surface of the lens

120. Transmission of visual signals to the primary visual cortex from the retina includes a synapse in which structure?
A) Lateral geniculate nucleus
B) Medial geniculate nucleus
C) Pretectal nucleus
D) Superior colliculus
E) Suprachiasmatic nucleus

121. Which of the following statements regarding retinal ganglion cells is correct?
A) One W ganglion cell from the periphery of the retina typically transmits information from one rod
B) One X ganglion cell from the fovea typically transmits information from as many as 200 cones
C) W ganglion cells respond best to directional movement or vision under very bright conditions
D) X ganglion cells respond best to color images and are the most numerous of the three types of ganglion cells
E) Y ganglion cells respond best to rapid changes in the visual image and are the most numerous of the three types of ganglion cells

122. Auditory information is relayed through which thalamic nucleus?
A) Dorsomedial nucleus
B) Lateral geniculate nucleus
C) Medial geniculate nucleus
D) Ventral posterolateral nucleus
E) Ventral posteromedial nucleus

123. The phenomenon of taste preference is
A) a central nervous system process
B) the result of neonatal stimulation of circumvallate papilla
C) a learned behavior in animals
D) a result of taste bud maturation
E) a result of taste bud proliferation following exposure to glutamic acid

124. Of the photoreceptors listed below which one responds to the broadest spectrum of wavelengths of light?
A) Rod receptors
B) Green cone receptors
C) Blue cone receptors
D) Red cone receptors
E) Cells containing melanin in the pigment layer

125. Which of the following structures secretes the intraocular fluid of the eye?
A) Ciliary processes
B) Cornea
C) Iris
D) Lens
E) Trabeculae

125=A 124=D 123=A 122=C 121=D 120=A 119=A

Cont.

126. Which type of papillae is located in the posterior part of the tongue?
A) Circumvallate
B) Foliate
C) Fungiform
D) Fungiform and circumvallate
E) Papilla of Vater

127. Which structure functions to ensure that each of the three sets of extraocular muscles is reciprocally innervated so that one muscle of the pair relaxes while the
other contracts?
A) Edinger-Westphal nucleus
B) Medial longitudinal fasciculus
C) Pretectal nucleus
D) Superior colliculus
E) Suprachiasmatic nucleus

128. Which of the following retinal cells have action potentials?
A) Amacrine cells
B) Bipolar cells
C) Ganglion cells
D) Horizontal cells
E) Photoreceptors

129. Which type of papillae is located in the folds along the lateral surfaces of the tongue?
A) Circumvallate
B) Foliate
C) Fungiform
D) Fungiform and circumvallate
E) Papilla of Vater

130. The primary auditory cortex lies primarily in which lobe of the cerebral cortex?
A) Frontal lobe
B) Limbic lobe
C) Occipital lobe
D) Parietal lobe
E) Temporal lobe

131. The intraocular fluid of the eye flows from the canal of Schlemm into which of the following locations?
A) Anterior chamber
B) Aqueous veins
C) Lens
D) Posterior chamber
E) Trabeculae

131=B 130=E 129=A 128=C 127=B 126=A

Cont.

132. The first central synapse for neurons transmitting the sweet taste sensation is in which of the following structures?
A) Dorsal sensory nucleus of vagus nerve
B) Nucleus of solitary tract
C) Nucleus of olfactory nerve
D) Nucleus of hypoglossal nerve
E) Nucleus of facial nerve

133. Which brainstem structure plays a major role in determining the direction from which a sound originates?
A) Cochlear nucleus
B) Inferior colliculus
C) Lateral lemniscus
D) Superior olivary nucleus
E) Trapezoid

134. Visual contrast is enhanced due to lateral inhibition by which retinal cells?
A) Amacrine cells
B) Bipolar cells
C) Ganglion cells
D) Horizontal cells
E) Photoreceptors

135. Which of the following best describes the underlying basis of the dark current in the outer segment of the photoreceptors?
A) Dark current results from the influx of sodium ions via c-AMP–dependent sodium channels
B) Dark current results from the influx of sodium ions via c-GMP–dependent sodium channels
C) Dark current results from the efflux of potassium ions via c-GMP–dependent potassium channels
D) Dark current results from the efflux of sodium ions via c-GMP–dependent sodium channels
E) Dark current results from the efflux of sodium ions via c-AMP–dependent sodium channels

136. The phylogenetically new cerebral cortex, the neocortex,is composed of six layers tangential to the pial surface of the hemisphere. Which of the following statements concerning the organization of these six layers is correct?
A) The neurons in layers I, I, and III perform most of the thalamocortical connections within the same hemisphere
B) The neurons in layers II and III form connections with the basal ganglia
C) Specific incoming signals from the cerebellum terminate primarily in layer IV
D) The neurons in layer V have axons that extend beyond layer V to subcortical regions and the spinal cord
E) The neurons in layer VI send their axons to the hippocampus

132=B 133=D 134=D 135=B 136=D

Cont.

137. As they leave the spinal cord and course peripherally to skeletal muscle, the axons of motor neurons must pass through which of the following structures?
A) Posterior column
B) Posterior root
C) Ventral white commissure
D) Posterior horn
E) Anterior root

138. Which of the following items is the type of neuron whose axon forms synaptic junctions with the skeletal muscle cells (extrafusal fibers) that comprise the major part of a muscle?
A) Alpha motor neurons
B) Pyramidal neurons
C) Gamma motor neurons
D) Granule cells
E) Purkinje cells

139. Ascending fibers from the excitatory elements of the reticular activating system reach the intralaminar nuclei of the thalamus and from there they are distributed to which of the following locations?
A) They project to the somatosensory nuclei of the thalamus
B) They extend widely throughout many areas of cortex
C) They reach the motor nuclei of the thalamus
D) They course primarily to the precentral gyrus
E) They extend primarily to the postcentral gyrus

140. Which of the following statements concerning the general functional role of the cerebellum is correct?
A) The cerebellum directly stimulates motor neurons required to make a movement
B) The cerebellum is unable to make corrective adjustments to the movement once it is performed
C) The cerebellum does not receive feedback from muscles that execute the actual movement
D) The cerebellum is not involved in the planning of a movement, only its execution
E) The cerebellum plays an active role in the coordination of the muscles required to make a movement

141. Which of the following spinal cord levels contains the entire population of preganglionic sympathetic neurons?
A) C5-T1
B) C3-C5
C) S2-S4
D) T1-L2
E) T6-L1

D=141 E=140 B=139 A=138 E=137

Cont.

142. Which of the following statements best describes a functional role for the lateral hemispheres of the cerebellum?
A) Controls and coordinates movements of the axial muscles as well as the shoulder and hip
B) Controls movements that involve distal limb musculature
C) Functions with the cerebral cortex to plan movements
D) Stimulates motor neurons through its connections to the spinal cord

143. Which of the following items would produce an increase in cerebral blood flow?
A) Increase in carbon dioxide concentration
B) Increase in oxygen concentration
C) Decrease in the activity of cerebral cortex neurons
D) Decrease in carbon dioxide concentration
E) Decrease in arterial blood pressure from 120 mm Hg to 90 mm Hg

144. Which of the following is the correct Brodmann number designation for the primary motor cortex?
A) 6
B) 5
C) 4
D) 3
E) 1

145. Which of the following body parts is represented most laterally and inferiorly within the primary motor cortex?
A) Face
B) Hand
C) Neck
D) Abdomen
E) Lower limb

146. Which of the following items is the type of neuron whose axon forms synaptic junctions with skeletal muscle cells (intrafusal fibers) within the muscle spindles?
A) Alpha motor neurons
B) Pyramidal neurons
C) Gamma motor neurons
D) Granule cells
E) Purkinje cells

147. Preganglionic sympathetic axons pass through which of the following structures?
A) Dorsal root
B) Dorsal primary rami
C) White rami
D) Gray rami
E) Ventral primary rami

147=C 146=C 145=A 144=C 143=A 142=C

Cont.

148. Which of the following statements best describes a functional role for the cerebellar vermis?
A) Controls and coordinates movements of the axial muscles as well as the shoulder and hip
B) Controls movements that involve distal limb musculature
C) Functions with the cerebral cortex to plan movements
D) Stimulates motor neurons through its connections to the spinal cord

149. Which of the following statements about sleep is correct?
A) Although fast-wave sleep is frequently referred to as "dreamless sleep," dreams and sometimes nightmares do occur at this time
B) Individuals rarely will awaken spontaneously from rapid eye movement (REM) sleep
C) Muscle tone throughout the body is markedly suppressed during REM sleep
D) Heart rate and respiratory rate typically become very regular during REM sleep

150. Which of the following statements concerning intrinsic spinal cord circuitry is correct?
A) Motor neurons greatly outnumber spinal cord interneurons
B) Most incoming sensory fibers from the periphery synapse with motor neurons and not interneurons
C) Most descending supraspinal motor system axons synapse directly with motor neurons
D) Spinal cord interneurons are localized solely within the anterior horn
E) Both excitatory and inhibitory interneurons are found in the spinal cord

151. Which of the following statements best describes afunctional role for the intermediate zone of the cerebellum?
A) Controls and coordinates movements of the axial muscles as well as the shoulder and hip
B) Controls movements that involve distal limb musculature
C) Functions with the cerebral cortex to plan movements
D) Stimulates motor neurons through its connections to the spinal cord

152. The gigantocellular neurons of the reticular formation release which of the following neurotransmitters?
A) Norepinephrine
B) Serotonin
C) Dopamine
D) Acetylcholine
E) Glutamate

153. A large portion of the cerebral cortex does not fit into the conventional definition of motor or sensory cortex. Which of the terms below is used to refer to the type of cortex that receives input primarily from several other regions of the cerebral cortex?
A) Cortex that is agranular
B) Secondary somatosensory cortex
C) Association cortex
D) Supplementary motor cortex
E) Secondary visual cortex

C=153 D=152 B=151 E=150 C=149 A=148

Cont.

154. Which statement concerning the premotor cortex is correct?
A) The premotor cortex is located just posterior to the primary motor cortex.
B) The lateral to medial sequence in the somatotopic organization of the premotor cortex is just the reverse of that seen in the primary motor cortex.
C) Stimulation of a small discrete group of neurons in premotor cortex will produce contraction of an individual muscle.
D) Stimulation of premotor cortex does not lead to any muscle activation.
E) The premotor cortex sets the specific posture required for the limb to produce the desired movement.

155. Which of the following features is characteristic of the supplementary motor cortex?
A) It has no somatotopic representation of the body.
B) Stimulation of the supplementary motor cortex leads to bilateral movements, typically involving both hands.
C) It is located just anterior to the premotor cortex on the lateral surface of the hemisphere.
D) Like the premotor cortex, stimulation in the supplementary motor cortex leads to discrete movement of individual muscles.
E) The supplementary cortex functions totally independent of the premotor and primary motor cortex.

156. Administration of a drug that blocks serotonin production will have which of the following effects on sleep?
A) Sleep induction will be almost immediate
B) Rapid eye movement (REM) sleep will be blocked
C) Sleep induction will be significantly prolonged or blocked
D) REM sleep will be immediately induced

157. Which brain structure serves as the major controller of the limbic system?
A) Hypothalamus
B) Hippocampus
C) Amygdala
D) Mammillary body
E) Fornix

158. Which of the following projection systems is contained in the superior cerebellar peduncle?
A) Pontocerebellar
B) Cerebellothalamic
C) Posterior spinocerebellar
D) Corticospinal

159. Which of the following terms applies to the combination of a motor neuron and all the skeletal muscle fibers contacted by that motor neuron?
A) Golgi tendon organ
B) Motor unit
C) Propriospinal neurons
D) Skeletal muscle fibers

154=E 155=B 156=C 157=A 158=B 159=B

Cont.

160. The creation of memory can be interrupted by which of the following activities?
A) Phosphorylation of a potassium channel to block activity
B) Activation of adenylate cyclase
C) Unnatural loss of consciousness
D) Increase in protein synthesis
E) Activation of cGMP phosphodiesterase

161. The condition of prosopagnosia usually results from dysfunction or damage to which area of the cerebral cortex?
A) Prefrontal area
B) Junction of parietal and temporal lobe on nondominant side of the brain
C) Frontal eye fields
D) Underside of medial occipital and temporal lobes
E) Limbic association areas of frontal and anterior temporal lobes

162. Lesions of which of the following areas of the brain would have the most devastating effect on verbal and symbolic intelligence?
A) Hippocampus
B) Amygdala
C) Wernicke's area on the non-dominant side of the brain
D) Broca's area
E) Wernicke's area on the dominant side of the brain

163. The two hemispheres of the brain are connected by which nerve fibers or pathways?
A) Lateral lemniscus
B) Corticofugal fibers
C) Corpus callosum
D) Arcuate fasciculus
E) Medial longitudinal fasciculus

164. Broca's area is a specialized portion of motor cortex. Which of the following conditions best describes the deficit resulting from damage to Broca's area?
A) Spastic paralysis of the contralateral hand
B) Paralysis of the muscles of the larynx and pharynx
C) Inability to use the two hands to grasp an object
D) Inability to direct the two eyes to the contralateral side
E) Inability to speak whole words correctly

165. A stroke involving the middle cerebral artery on the left side is likely to cause which of the following symptoms?
A) Paralysis of left side of face and left upper extremity
B) Paralysis of left lower extremity
C) Complete loss of vision in both eyes
D) Loss of ability to comprehend speech
E) Loss of vision in left half of both eyes

165=D 164=E 163=C 162=E 161=D 160=E

Cont.

166. The fibers of the corticospinal tract pass through which one of the following structures?
A) Medial lemniscus
B) Medullary pyramid
C) Posterior funiculus
D) Medial longitudinal fasciculus
E) Anterior roots

167. Which of the following structures serves to connect Wernicke's area to Broca's area in the cerebral cortex?
A) Arcuate fasciculus
B) Lateral lemniscus
C) Medial longitudinal fasciculus
D) Anterior commissure
E) Internal capsule

168. Which of the following maneuvers will attenuate the stretch reflex in skeletal muscle?
A) Sectioning the dorsal root of a spinal nerve
B) Disruption of the spinocerebellar tract
C) Disruption of the corticospinal tract
D) Sectioning the medial lemniscus on the contralateral side of the skeletal muscle in question
E) Creating a lesion in the contralateral globus pallidus

169. The peripheral sensory input that activates the ascending excitatory elements of the reticular formation comes mainly from which of the following?
A) Pain signals
B) Proprioceptive sensory information
C) Corticospinal system
D) Medial lemniscus
E) Input from Pacinian corpuscles

170. Signals from motor areas of the cortex reach the contralateral cerebellum after first passing through which one of the following structures?
A) Thalamus
B) Caudate nucleus
C) Red nucleus
D) Basilar pontine nuclei
E) Dorsal column nuclei

171. Cells of the adrenal medulla receive synaptic input from which of the following types of neurons?
A) Preganglionic sympathetic neurons
B) Postganglionic sympathetic neurons
C) Preganglionic parasympathetic neurons
D) Postsynaptic parasympathetic neurons
E) Presynaptic parasympathetic neurons

B=991 A=791 A=891 A=691 D=071 A=171

Cont.

172. Which of the following statements about muscle and passive stretch of muscle spindles is true?
A) Primary (Ia) sensory fibers increase their firing rate
B) Secondary sensory fibers decrease their firing rate
C) Alpha motor neurons are inhibited
D) Gamma motor neurons are stimulated
E) Muscle spindles go completely slack

173. Which of the following statements concerning electroencephalogram activity is correct?
A) Beta waves occur in normal adults who are awake but in a quiet, resting state
B) Alpha waves occur at 14 to 80 cycles per second during periods of heightened excited activity or high tension
C) Theta waves are commonly seen in children but also occur in adults during emotional disappointment or in degenerative brain states
D) Delta waves are characteristic of slow wave sleep
E) Both C and D are correct

174. Which of the following projection systems is contained in the middle cerebellar peduncle?
A) Pontocerebellar projections
B) Cerebellothalamic projections
C) Posterior spinocerebellar projections
D) Corticospinal projections
E) Ventrospinocerebellar projections

175. Which of the following projection systems is contained in the inferior cerebellar peduncle?
A) Pontocerebellar projections
B) Cerebellothalamic projections
C) Posterior spinocerebellar projections
D) Corticospinal projections
E) Dorsospinocerebellar projections

176. Cerebrospinal fluid (CSF) provides a cushioning effect both inside and outside the brain. Which of the following spaces lies outside the brain or spinal cord and contains CSF?
A) Lateral ventricle
B) Third ventricle
C) Cisterna magna
D) Epidural space
E) Aqueduct of Sylvius

177. In a muscle spindle receptor, which type of muscle fiber is responsible for the dynamic response?
A) Extrafusal muscle fiber
B) Static nuclear bag fiber
C) Nuclear chain fiber
D) Dynamic nuclear bag fiber
E) Smooth muscle fibers

172=A 173=E 174=A 175=C 176=C 177=D

Cont.

178. Neurological disease associated with the cerebellum produces which of the following types of symptoms?
A) Resting tremor
B) Athetosis
C) Rigidity
D) Ataxia
E) Akinesia

179. Preganglionic parasympathetic neurons that contribute to the innervation of the descending colon and rectum are found in which of the following structures?
A) Superior cervical ganglion
B) Dorsal motor nucleus of the vagus
C) Superior mesenteric ganglion
D) Ciliary ganglion
E) Spinal cord levels S2 and S3

180. A complex spike pattern in the Purkinje cells of the cerebellum can be initiated by stimulation of which of the following brain areas?
A) Inferior olivary complex
B) Brainstem reticular nuclei
C) Neurons in red nucleus
D) Superior olivary complex
E) Dorsal vestibular nucleus

181. Which of the following activities will increase the sensitivity of the stretch reflex?
A) Cutting the dorsal root fibers associated with the muscle in which the stretch reflex is being examined
B) Increasing the activity of the medullary reticular nuclei
C) Bending the head forward
D) Enhanced activity in the fusimotor (gamma motor neuron) system
E) Stimulating the lateral hemispheres of the cerebellum

182. Which of the following structures serves as an "alternative pathway" for signals from the motor cortex to the spinal cord?
A) Red nucleus
B) Basilar pontine nuclei
C) Caudate nucleus
D) Thalamus
E) Dorsal column nuclei

183. The phenomenon of decerebrate rigidity can be explained, at least in part, by which of the following?
A) Stimulation of type 1b sensory neurons
B) Loss of cerebellar inputs to the red nucleus
C) Overactivity of the medullary reticular nuclei involved in motor control
D) Unopposed activity of the pontine reticular nuclei
E) Degeneration of the nigrostriatal pathway

D=183 A=182 D=181 A=180 E=179 D=178

Cont.

184. Like the primary visual cortex, the primary motor cortex is organized into vertical columns composed of cells linked together throughout the six layers of the cortex. The cells that contribute axons to the corticospinal tract are concentrated in which cortical layer?
A) Layer I
B) Layer II
C) Layer III
D) Layer IV
E) Layer V

185. When a muscle is suddenly stretched, a signal is transmitted over Ia sensory fibers from muscle spindles. Which of the following statements best describes the response elicited by these spindle afferent signals?
A) Contraction of the muscle in which the active spindles are located
B) Relaxation of the muscle in which the active spindles are located
C) Contraction of muscles antagonistic to those in which the active spindles are located
D) Relaxation of intrafusal fibers in the active spindles
E) Direct synaptic activation of gamma motor neurons

186. Which of the following foramina allows cerebrospinal fluid to pass directly from the ventricular system into the subarachnoid space?
A) Foramen of Magendie
B) Aqueduct of Sylvius
C) Third ventricle
D) Lateral ventricle
E) Arachnoid villi

187. There is an area in the dominant hemisphere, which when damaged, might leave the sense of hearing intact but not allow words to be arranged into a comprehensive thought. Which of the following terms is used to identify this portion of the cortex?
A) Primary auditory cortex
B) Wernicke's area
C) Broca's area
D) Angular gyrus
E) Limbic association cortex

188. Efferent fibers from the cerebellum originate in
A) Deep cerebellar nuclei
B) Purkinje cell layer of cerebellar cortex
C) Granular cell layer of cerebellar cortex
D) Molecular cell layer of cerebellar cortex
E) Floccular cortex of cerebellum

189. Afferent signals from the periphery of the body travel to the cerebellum in which of the following nerve tracts?
A) Ventral spinocerebellar tract
B) Fastigioreticular tract
C) Vestibulocerebellar tract
D) Reticulocerebellar tract
E) Dorsal spinocerebellar tract

E=184 A=185 A=186 B=187 A=188 E=189

Cont.

190. Motor cortex neurons receive feedback from muscles activated by the corticospinal system. This feedback arises from which of the following structures?
A) Red nucleus
B) Spinocerebellar tracts
C) Skin surface of fingers used to grasp an object
D) Muscle spindles in muscles antagonistic to those used to make the movement
E) Vestibular nuclei

191. Which epileptic condition involves a postictal depression period lasting from several minutes to perhaps as long as several hours?
A) Grand mal seizure
B) Petit mal seizure
C) Jacksonian seizure
D) Phase-out clonic seizure
E) Temporal lobe seizure

192. The sweat glands and piloerector muscles of hairy skin are innervated by which of the following fiber types?
A) Cholinergic postganglionic parasympathetic fibers
B) Cholinergic postganglionic sympathetic fibers
C) Adrenergic preganglionic parasympathetic fibers
D) Adrenergic postganglionic sympathetic fibers
E) Adrenergic preganglionic sympathetic fibers

193. In controlling the fine muscles of the hands and fingers, corticospinal axons can synapse primarily with which of the following?
A) Posterior horn neurons
B) Spinal cord interneurons
C) Spinal cord motor neurons
D) Purkinje cells
E) Renshaw cells

194. Which of the following statements concerning spinal cord motor circuits is correct?
A) Dynamic gamma motor neurons innervate static nuclear bag fibers
B) Descending supraspinal axons will synapse with either alpha or gamma motor neurons
C) Clonus is caused by a hyperactive stretch reflex
D) The contractile elements of intrafusal fibers are found at the central (nuclear) region of the fiber
E) Both types of sensory fibers in a muscle spindle are mechanoreceptors that signal stretch of the two polar, noncontractile ends of the intrafusal fiber

195. Which of the following cells receives direct synaptic input from Golgi tendon organs?
A) Type Ia inhibitory interneurons
B) Dynamic gamma motor neurons
C) Alpha motor neurons
D) Type Ib inhibitory interneurons
E) Type II excitatory interneurons

D=195 C=194 C=193 B=192 A=191 C=190

Cont.

196. Which of the following neurotransmitters is used by the axons of locus ceruleus neurons that distribute throughout much of the brain?
A) Norepinephrine
B) Dopamine
C) Serotonin
D) Acetylcholine

197. Which of the following statements concerning mossy and climbing fibers is correct?
A) Mossy fibers provide direct excitatory input to Purkinje cells
B) Climbing fibers evoke simple spikes in Purkinje cells
C) All spinocerebellar axons terminate as mossy fibers in the cerebellar cortex
D) All pontocerebellar axons terminate as climbing fibers in the cerebellar cortex
E) All climbing fibers originate in the red nucleus

198. Fine motor movement of the index finger can be elicited by stimulation of which of the following brain areas?
A) Primary motor cortex
B) Lateral cerebellar hemisphere
C) Premotor cortex
D) Supplemental motor area
E) Red nucleus

199. The perivascular space (Virchow-Robin space) in the brain is formed between the wall of small penetrating vessels and which of the following structures?
A) Dura mater
B) Arachnoid membrane
C) Pia mater
D) Choroid plexus
E) Ependymal cells

200. Which of the following types of seizures is associated with a spike and dome EEG pattern during the seizure activity?
A) Grand mal seizures
B) Temporal lobe seizures
C) Jacksonian seizures
D) Petit mal seizures
E) Apoplectic seizures

201. The excitatory or inhibitory effect of a postganglionic sympathetic fiber is determined by which of the following features or structures?
A) Function of the postsynaptic receptor to which it binds
B) Specific organ innervated
C) Ganglion where the postganglionic fiber originates
D) Ganglion containing the preganglionic fiber
E) Emotional state of the individual

196=A 197=C 198=A 199=C 200=D 201=A

Cont.

202. Which of the following neurotransmitters is used by the axons of substantia nigra neurons that project to the caudate and putamen?
A) Norepinephrine
B) Dopamine
C) Serotonin
D) Acetylcholine
E) GABA

203. Which of the following statements concerning the function of cerebellar neurons is correct?
A) Basket cells evoke excitatory responses in Purkinje cells
B) Granule cells evoke excitatory responses in Purkinje cells
C) Golgi cells evoke excitatory responses in basket cells
D) Purkinje cells evoke excitatory responses in cerebellar nuclear cells
E) Stellate cells evoke excitatory responses in basket cells

204. Which of the following items correctly describes the relationship of cerebrospinal fluid pressure to the venous pressure in the superior sagittal sinus?
A) A few millimeters higher
B) A few millimeters lower
C) Equal to
D) Twice the value
E) One-half the value

205. A vascular lesion that causes degeneration of corticospinal axons in the basilar pons will most likely lead to which of the following conditions?
A) Paralysis primarily involving muscles around the contralateral should and hip joints
B) Paralysis of the muscles of mastication
C) Loss of voluntary control of discrete movements of the contralateral hand and fingers
D) Inability to speak clearly
E) Inability to convert short-term memory to longterm memory

206. Which statement best describes a characteristic functional difference between a Golgi tendon organ and a muscle spindle?
A) The output signals of a Golgi tendon organ lead to inactivation of the muscle associated with the active tendon organ
B) Golgi tendon organs do not function in the course of voluntary movements that require a normal level of tension development in the associated muscle
C) Signals arising from Golgi tendon organs do not contribute to conscious proprioception
D) Signals arising from Golgi tendon organs are synaptically linked directly to an alpha motor neuron
E) The signals from a Golgi tendon organ are conducted along sensory fibers that conduct more rapidly than those of the muscle spindle

202=B 203=B 204=A 205=C 206=A

Cont.

207. The cerebellum is sometimes described as a "timing device." Which of the following statements best describes the basis for this function?
A) The cerebellum receives visual input that enables it to determine any point in the 24-hour light-dark cycle
B) The cerebellum computes the exact time used to excite adjacent Purkinje cells
C) The cerebellar circuitry determines only the duration or end-point of each movement
D) The cerebellar circuitry enhances the turn-on and turn-off times for each movement by delivering an excitatory signal followed by a precisely timed inhibitory signal
E) The cerebellar circuitry determines only the precise timing of the turn-on signal, and the turn-off signal begins when the cerebellum ceases to Function

208. Output signals from Golgi tendon organs are transmitted to which of the following higher centers?
A) Inferior colliculus
B) Globus pallidus
C) Cerebellum
D) Red nucleus
E) Substantia nigra

209. Which type of cholinergic receptor is found at synapses between preganglionic and postganglionic neurons of the sympathetic system?
A) Muscarinic
B) Nicotinic
C) Alpha
D) Beta1
E) Beta2

210. Damage limited to the primary motor cortex (area 4) is thought to cause hypotonia in the affected muscles. However, most cortical lesions, particularly those caused by vascular infarcts, generally involve primary motor cortex in addition to surrounding areas of cortex or cortical efferent axons. The latter type of cortical lesion will cause which of the following?
A) Spastic muscle paralysis
B) Flaccid muscle paralysis
C) No paralysis, only jerky, fast movements
D) Complete blindness in the contralateral eye
E) Loss of sensation in the contralateral foot

211. The term limbic cortex includes the orbitofrontal cortex, subcallosal gyrus, cingulate gyrus, and which one of the following areas?
A) Supplementary motor cortex
B) Postcentral gyrus
C) Lingual gyrus
D) Parahippocampal gyrus
E) Paracentral lobule

207=D 208=C 209=B 210=A 211=D

Cont.

212. The cerebellum participates in the learning of motor skills, and the climbing fiber input to Purkinje cells is thought to be most important to this process. Which of the following statements concerning this process is correct?

A) Under resting conditions, climbing fibers evoke complex spikes in Purkinje cells at a very rapid rate
B) When a novel movement is performed, the actual movement may not match the intended movement, which tends to decrease the firing rate of climbing fiber-initiated simple spikes
C) The decrease in climbing fiber input decreases the overall sensitivity (excitability) of the Purkinje cells
D) On the very first trial of the new movement, the Purkinje cell adopts a new, relatively long-term level of excitability
E) Neurons in the inferior olivary complex and their axons projecting to the cerebellum are important contributors to the process

213. Occlusion of which of the following structures would lead to communicating hydrocephalus?

A) Aqueduct of Sylvius
B) Lateral ventricle
C) Foramen of Luschka
D) Foramen of Magendie
E) Arachnoid villi

214. Evaluation of a patient reveals the following deficits:(1) decreased aggressiveness and ambition, and inappropriate social responses; (2) inability to process sequential thoughts in order to solve a problem; and (3) inability to process multiple bits of information that could then be recalled instantaneously to complete a thought or solve a problem. Damage to which of the following brain regions might be responsible for such deficits?

A) Premotor cortex
B) Parieto-occipital cortex in nondominant hemisphere
C) Broca's area
D) Limbic association cortex
E) Prefrontal association cortex

215. The withdrawal reflex is initiated by stimulation delivered to which of the following receptors?

A) Muscle spindle
B) Joint capsule receptor
C) Cutaneous free nerve ending
D) Golgi tendon organ
E) Pacinian corpuscle

216. Which substance activates adrenergic alpha and beta receptors equally well?

A) Acetylcholine
B) Norepinephrine
C) Epinephrine
D) Serotonin
E) Dopamine

212=E 213=E 214=E 215=C 216=C

Cont.

217. The posterior and lateral hypothalamus, in combination with the preoptic area, are involved in the control of which of the following functions?
A) Cardiovascular functions involving blood pressure and heart rate
B) Regulation of thirst and water intake
C) Stimulation of uterine contractility and milk ejection from the breast
D) Signaling that food intake is sufficient (satiety)
E) Secretion of hormones from the anterior lobe of the pituitary gland

218. Which statement concerning the reticulospinal system is correct?
A) Reticulospinal neurons do not receive input from motor areas of the cerebral cortex
B) Medullary reticulospinal fibers excite motor neurons that activate extensor muscles
C) Pontine reticulospinal fibers course in the spinal cord posterior funiculus
D) Medullary reticulospinal fibers course in the medial part of the ventral funiculus of the spinal cord
E) Pontine reticulospinal fibers excite spinal cord motor neurons that activate limb extensor muscles

219. The neurons located in the locus ceruleus release which of the following neurotransmitters at their synaptic terminals?
A) Norepinephrine
B) Dopamine
C) GABA
D) Acetylcholine
E) Serotonin

220. In the patellar tendon reflex, which of the following items will synapse directly on alpha motor neurons that innervate the muscle being stretched?
A) Ia sensory fiber
B) Ib sensory fiber
C) Excitatory interneurons
D) Gamma motor neurons
E) Inhibitory interneurons

221. Which of the following statements best describes the functional role played by the pontine reticulospinal fibers in comparison to the medullary reticulospinal system?
A) The pontine system works in concert with the medullary system with each providing excitatory influence to extensor muscles
B) The pontine system essentially functions in an opposing manner relative to the medullary system
C) The pontine system provides an initial slow excitatory influence, which is then followed by rapid excitation from the medullary system
D) The medullary system provides slow excitation to extensor motor neurons, whereas the pontine system provides slow excitation of flexor motor neurons
E) The medullary system provides excitation to upper limb extensor motor neurons, whereas the pontine system provides excitation for lower limb extensor motor neurons

222. Which of the following reflexes is correctly paired with the sensory structure that mediates the reflex?
A) Autogenic inhibition—muscle spindle
B) Reciprocal inhibition—Golgi tendon organ
C) Reciprocal inhibition—Pacinian corpuscle
D) Stretch reflex—muscle spindle
E) Golgi tendon reflex—Meissner corpuscle

217=A 218=E 219=A 220=A 221=B 222=D

Cont.

223. Which of the following items represents the structural basis of the blood–cerebrospinal fluid barrier?
A) Tight junctions between the ependymal cells forming the ventricular walls
B) Arachnoid villi
C) Tight junctions between adjacent choroid plexus cells
D) Astrocyte foot processes
E) Tight junctions between adjacent endothelial cells of brain capillaries

224. Damage to which of the following brain areas leads to the inability to comprehend the written or the spoken word?
A) Insular cortex on the dominate side of the brain
B) Anterior occipital lobe
C) Junction of the parietal, temporal, and occipital lobes
D) Medial portion of the precentral gyrus
E) Most anterior portion of the temporal lobe

225. In an otherwise normal individual, dysfunction of which brain area will lead to behavior which is not appropriate for the given social occasion?
A) Ventromedial nuclei of hypothalamus
B) Amygdala
C) Corpus callosum
D) Fornix
E) Uncus

226. Nasal, lacrimal, salivary, and gastrointestinal glands are stimulated by which of the following substances?
A) Acetylcholine
B) Norepinephrine
C) Epinephrine
D) Serotonin
E) Dopamine

227. Which of the following reflexes best describes incoming pain signals that elicit movements performed by antagonistic muscle groups on either side of the body?
A) Crossed extensor reflex
B) Withdrawal reflex
C) Reciprocal inhibition
D) Autogenic inhibition

228. The spinocerebellum is involved in the control of ballistic movements. This type of movement is entirely preplanned in that the initiation, trajectory, and endpoint are programmed by the cerebellum. Which of the following statements is correct concerning the symptoms observed in patients with cerebellar lesions that interfere with ballistic movements?
A) Movements are slow to be initiated
B) The speed of the movement is faster than desired
C) The movement turn-off is reached more quickly
D) Spastic paralysis appears in the affected muscle group
E) A resting tremor develops in the affected limbs

228=A 227=A 226=A 225=B 224=C 223=C

Cont.

229. Decerebrate rigidity results from which of the following situations?
A) Damage to the brainstem systems that control flexor motor neurons
B) Overactivity in the medullary reticulospinal system leads to hyperactivity in limb extensor muscles
C) An imbalance in the activity of medullary and pontine reticulospinal systems such that excitation of extensor motor neurons is the end result
D) Interruption of the medullary reticulospinal axons
E) Interruption of the pontine reticulospinal axons

230. Brain edema is a serious complication of altered fluid dynamics in the brain. Continued progression of brain edema may lead to which of the following situations?
A) Relaxation of the vasculature smooth muscle and decreased blood flow
B) Increased blood flow leading to increased oxygen concentration
C) Vasoconstriction and decreased edema
D) Relaxation of the vasculature smooth muscle and increased blood flow
E) Compression of blood vessels leading to ischemia and compensatory capillary dilation

231. Which portion of the cerebellum functions in the planning of sequential movement?
A) Vermis and fastigial nucleus
B) Intermediate zone and fastigial nucleus
C) Lateral hemisphere and interposed nucleus
D) Cerebrocerebellum and dentate nucleus
E) Spinocerebellum and interposed nucleus

232. Bilateral lesions involving the ventromedial hypothalamus will lead to which of the following deficits?
A) Decreased eating and drinking
B) Loss of sexual drive
C) Excessive eating, rage and aggression, hyperactivity
D) Uterine contractility, mammary gland enlargement
E) Obsessive compulsive disorder

233. Which structure is an important pathway for communication between the limbic system and the brainstem?
A) Mamillothalamic tract
B) Fornix
C) Anterior commissure
D) Indusium griseum
E) Medial forebrain bundle

234. Which of the following terms best describes the cerebellar deficit in which there is a failure to perform rapid alternating movements indicating a failure of "progression" from one part of the movement to the next?
A) Past-pointing
B) Intention tremor
C) Dysarthria
D) Cerebellar nystagmus
E) Dysdiadochokinesia

234=E 233=E 232=C 231=D 230=E 229=C

Cont.

235. The function of which of the following organs or systems is dominated by the sympathetic nervous system?
A) Systemic blood vessels
B) Heart
C) Gastrointestinal gland secretion
D) Salivary glands
E) Gastrointestinal motility

236. Which of the following structures in the vestibular apparatus is responsible for the detection of angular acceleration?
A) Statoconia
B) Macula
C) Semicircular canals
D) Saccule
E) Ampullae

237. A person who has had a traumatic brain injury seems to be able to understand the written and spoken word but cannot create the correct sounds to be able to speak a word that is recognizable. This person most likely has damage to which area of the brain?
A) Wernicke's area
B) Broca's area
C) Angular gyrus
D) Dentate nucleus
E) Prefrontal lobe

238. Schizophrenia is thought to be caused in part by excessive production and release of which of the following neurotransmitter agents?
A) Norepinephrine
B) Serotonin
C) Acetylcholine
D) Substance P
E) Dopamine

239. Which of the following structures is not considered to be part of the basal ganglia?
A) Caudate nucleus
B) Dentate nucleus
C) Substantia nigra
D) Putamen
E) Globus pallidus

240. Stimulation of which of the following subcortical areas can lead to contraction of a single muscle or small groups of muscles?
A) Dentate nucleus of the cerebellum
B) Ventrobasalar complex of the thalamus
C) Red nucleus
D) Subthalamic nucleus
E) Nucleus accumbens

235=A 236=C 237=B 238=E 239=B 240=C

Cont.

241. Under awake, resting conditions, brain metabolism accounts for about 15% of the total metabolism of the body, and this is among the highest metabolic rates of all tissues in the body. Which of the following cellular populations of the nervous system contributes most substantially to this high rate of metabolism?
A) Astrocytes
B) Neurons
C) Ependymal cells
D) Choroid plexus cells
E) Brain endothelial cells

242. The concept of "autonomic tone" is quite advantageous because it allows the nervous system to have much finer control over the function of an organ or organ system. This is exemplified in the control of systemic arterioles. Which of the following actions would lead to vasodilation of systemic arterioles?
A) Increased activity of preganglionic parasympathetic neurons
B) Decreased activity of postganglionic parasympathetic neurons
C) Increased activity of postganglionic sympathetic neurons
D) Decreased activity of postganglionic sympathetic neurons
E) Increased activity of preganglionic sympathetic neurons

243. Which structures in the cerebellum have a topographical representation of the body?
A) The dentate nucleus
B) The lateral hemispheres
C) The flocculonodular lobe
D) The vermis and intermediate
E) The cerebellar peduncles

244. Which statement concerning memory processing in the brain is correct?
A) The brain forms positive memory through facilitation of synaptic circuits, but is unable to form negative memory by learning to ignore irrelevant information
B) Short-term memory is considered to be a list of 7–10 discrete facts that can be recalled within a period of a several hours
C) It appears that rehearsal and repetition of information is not advantageous in converting shortterm memory to long-term memory
D) Lesions involving the hippocampus cause a profound deficit in short-term memory
E) No morphologic or structural changes occur in the process of long-term memory formation

245. Which of the following structures is maximally sensitive to linear head movement in the vertical plane?
A) Macula of the utricle
B) Macula of the saccule
C) Crista ampullaris of the anterior semicircular duct
D) Crista ampullaris of the horizontal semicircular duct

246. Retrograde amnesia is the inability to recall long-term memories from the past. When damaged, which of the following brain regions leads to retrograde amnesia?
A) Hippocampus
B) Dentate gyrus
C) Amygdaloid complex
D) Thalamus
E) Mammillary nuclei of hypothalamus

246=D 245=B 244=D 243=D 242=D 241=B

Cont.

247. Hemiballismus, the sudden flailing movements of an entire limb, results when damage occurs to which area of the brain?
A) The subthalamic nucleus
B) The ventral basal complex of the thalamus
C) The globus pallidus
D) The red nucleus
E) The lateral hypothalamus

248. Although the sympathetic nervous system is often activated in such a way that it leads to mass activation of sympathetic responses throughout the body, it can also be activated to produce relatively discrete responses. Which of the following is an example of a local or discrete sympathetic action?
A) Heating of a patch of skin causes a relatively restricted vasodilation in the heated region
B) Food in the mouth causes salivation
C) Emptying of the bladder may cause reflexive emptying of the bowel
D) Dust particle in the eye causes increased tear fluid release
E) Bright light introduced into one eye

249. Which statement concerning the transduction mechanism in vestibular hair cells is correct?
A) Movement that bends the stereocilia away from the kinocilium has a depolarizing influence on the hair cell
B) The attachment of the stereocilia to the kinocilium is such that it activates voltage-gated sodium channels in the membrane of the kinocilium
C) Depolarization of the hair cell is achieved by inward movement of sodium from the endolymph
D) Deflection of the cupula such that stereocilia move toward the kinocilium causes the hair cell to depolarize
E) Inward movement of potassium through voltagegated potassium channels in the stereocilia membrane has a depolarizing influence on the hair cell

250. Which structure connects the hippocampus to the limbic system?
A) Mamillothalamic tract
B) Fornix
C) Anterior commissure
D) Medial forebrain bundle
E) Arcuate fasciculus

251. The condition of athetosis results when which area of the brain is dysfunctional?
A) Globus pallidus
B) Substantia nigra
C) Ventral anterior complex of the thalamus
D) Putamen
E) Purkinje cell layer of the cerebellum

252. Which component of the basal ganglia plays the major role in the control of cognitive (memory-guided) motor activity?
A) Globus pallidus
B) Substantia nigra
C) Caudate nucleus
D) Putamen
E) Subthalamic nucleus

247=A 248=A 249=D 250=B 251=A 252=C

Cont.

253. The brain's use of energy is among the highest of any organ in the body, but unfortunately the storage of glycogen in the brain is minimal and thus anaerobic glycolysis is not a significant source of energy. Considering this information about brain metabolism, which of the following statements is correct?

A) The brain is dependent on glucose delivery via the vascular system
B) Glucose delivered to the brain via the vascular system can be stored in neurons for several hours
C) Cessation of blood flow to the brain can be safely tolerated for up to about 10 minutes due to the considerable capacity for oxygen storage in brain tissue
D) Glucose delivery to neurons is vitally dependent on insulin
E) An overdose of insulin causes glucose to be rapidly transported into the brain at the expense of other insulin-dependent tissues

254. All the hair cells in the crista ampullaris of the horizontal semicircular duct have their stereocilia and kinocilium oriented according to which of the following patterns?

A) Same pattern with progressive increase in length of stereocilia from shortest to tallest with the tallest located adjacent to the kinocilium
B) Random pattern with progression from short to tall stereocilia such that the shortest is adjacent to the kinocilium
C) Same pattern with progressive decrease in length of stereocilia from tallest to shortest, with the shortest located adjacent to the kinocilium
D) Random pattern with progression from tallest to shortest stereocilia, with the shortest adjacent to the kinocilium
E) Random pattern with random distribution of stereocilia of various lengths

255. Stimulation of the punishment center can inhibit the reward center, demonstrating that fear and punishment can take precedence over pleasure and reward. Which of the following cell groups is considered the punishment center?

A) Lateral and ventromedial hypothalamic nuclei
B) Periventricular hypothalamus and midbrain central gray
C) Supraoptic nuclei of hypothalamus
D) Anterior hypothalamic nucleus

256. A wide variety of neurotransmitters have been identified in the cell bodies and afferent synaptic terminals in the basal ganglia. A deficiency of which of the following transmitters is typically associated with Parkinson disease?

A) Norepinephrine
B) Dopamine
C) Serotonin
D) GABA
E) Substance P

257. Drugs that stimulate specific adrenergic receptors are called sympathomimetic drugs. Which of the following is a sympathomimetic drug?

A) Reserpine
B) Phentolamine
C) Propranolol
D) L-dopa
E) Phenylephrine

253=A 254=A 255=B 256=B 257=E

Thank you!

اعمل لترسم بسمة، اعمل لتمسح دمعة، اعمل و أنت تعلم أن الله لا يضيع أجر من أحسن عملا.

Done by:

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