

Neuroscience I (2022-2028) Solution

1. Which of the following best describes the “blind spot” of the eye?

- a. Contains only rods and thus has monochromatic vision
- b. Area where chromatic aberration of the lens is the greatest
- c. Contains no blood vessels
- d. Located 5 degrees lateral to the central point of vision

☒ e. Exit point of the optic nerve

2. Cerebrospinal fluid enters the bloodstream via the:

- a. Interventricular foramen of Monro
- b. Median foramen of Magendie
- c. Choroid plexus

☒ d. Arachnoid villi

e. Lateral foramina of Luschka

3. The mammillary bodies are part of the:

☒ a. Diencephalon

- b. Pons
- c. Medulla
- d. Midbrain

4. Components of the central nervous system include all of the following except:

a. Spinal cord

☒ b. Spinal nerves

- c. Cerebellum
- d. Diencephalon

5. A 23-year-old man is brought to the emergency room after an automobile collision. He has weakness of the right lower extremity and loss of pain and temperature sensation on the left side beginning at the level of the umbilicus. Which level of spinal cord damage is most likely?

- ☒ a. T8 on the right
- b. T10 on the left
- c. T10 on the right
- d. T6 on the left
- e. T8 on the left

6. Which cells in layer IV of the primary visual cortex detect orientation of lines and borders?

- a. Border cells
- b. Complex cells
- c. Hypercomplex cells
- ☒ d. Simple cells
- e. Ganglion cells

7. A 57-year-old man presents with hoarseness. Examination reveals deviation of the uvula to the left, deviation of the tongue to the right, and weakness of facial muscles around the mouth on the right. Which additional finding is most likely?

- a. Weakness of masticatory muscles on the left
- b. Inability to turn head to the right against resistance
- c. Weakness of masticatory muscles on the right
- ☒ d. Inability to turn head to the left against resistance
- e. Inability to shrug the right shoulder

8. Which of the following reflexes is monosynaptic?

- a. Pupillary reflex
- b. Extensor plantar reflex
- c. Babinski reflex
- ☒ d. Achilles reflex
- e. Corneal reflex

9. The predominant neurons of the striatal system contain:

- a. Serotonin
- b. Dopamine
- c. Acetylcholine
- ☒ d. GABA
- e. Glutamate

10. 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

11. Broca's area is a specialized portion of motor cortex. Damage to Broca's area results in:

- ☒ a. Inability to speak whole words correctly
- b. Spastic paralysis of the contralateral hand
- c. Paralysis of laryngeal and pharyngeal muscles
- d. Inability to use both hands together
- e. Inability to direct eyes to the contralateral side

12. Which structure contains melanin-containing cells immediately internal to the crus cerebri?

- a. Reticular formation
- b. Pontine nuclei
- c. Red nucleus
- d. Locus ceruleus

☒ e. Substantia nigra

13. This structure is found at all levels of the spinal cord and is associated with light touch, pain, and temperature sensation. It is also called the dorsomarginal nucleus.

- a. Rexed lamina VI
- b. Rexed lamina II
- c. Rexed lamina III

☒ d. Rexed lamina I

- e. Rexed lamina X

14. The roof of the fourth ventricle is formed by the:

☒ a. Cerebellum

- b. Corpus callosum
- c. Thalamus
- d. Tectum

15. Which of the following is white matter of the brain?

- a. Thalamus
- b. Cerebellar cortex
- c. Lentiform nucleus
- d. Cerebral cortex

☒ e. Corpus callosum

16. A 28-year-old woman has drooping of the left lower facial muscles with sparing of the forehead. Identify the lesion type, site, and side.

- a. LMN lesion, facial nerve, left
- b. UMN lesion, trigeminal nerve, right
- ☒ c. UMN lesion, genu of internal capsule, right
- d. LMN lesion, posterior limb of internal capsule, right
- e. UMN lesion, posterior limb of internal capsule, left

17. Damage to the efferent portion of the muscle spindle involves which fiber type?

- a. A β
- b. B
- c. A α
- d. C
- ☒ e. A γ

18. Which statement regarding the basilar membrane is correct?

- a. Fiber length decreases from base to apex
- b. Separates scala media from scala vestibuli
- c. Spiral ganglion lies on its surface
- ☒ d. High frequency at base, low frequency at apex
- e. Fiber diameter increases from base to apex

19. A stroke involving the left middle cerebral artery is likely to cause:

- a. Paralysis of left face and upper limb
- b. Loss of vision in left half of both eyes
- c. Paralysis of left lower limb
- ☒ d. Loss of ability to comprehend speech
- e. Complete blindness

20. Decerebrate rigidity reflects dominant input to extensor motor neurons through reticulospinal tracts. Where are these fibers located in the spinal cord?

- a. Posterolateral area
- b. Anterolateral area**
- c. Intermediate zone
- d. Posterior columns
- e. Dorsolateral tract

21. Which structure connects Wernicke's area to Broca's area?

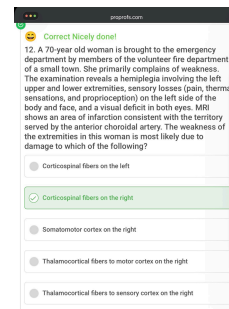
- a. Arcuate fasciculus**
- b. Lateral lemniscus
- c. Medial longitudinal fasciculus
- d. Internal capsule
- e. Anterior commissure

Involving The Left upper and lower extremities ... !!

22. Anterior choroidal artery infarction causes hemiplegia. Damage to which structure causes the weakness?

See

- a. Corticospinal fibers on the left
- b. Corticospinal fibers on the right**
- c. Thalamocortical fibers to sensory cortex on the right
- d. Thalamocortical fibers to motor cortex on the right
- e. Somatomotor cortex on the right



23. Which lesion is characteristic of Parkinson disease?

- a. Amyloid plaques
- b. Pick bodies
- c. Lewy bodies**
- d. Rosenthal fibers

24. The most common cause of aseptic meningitis is:

- ☒ a. Enteroviruses
- b. Mycobacterium tuberculosis
- c. Candida
- d. Cryptococcus

25. Which condition is associated with Rosenthal fibers?

- a. Meningioma
- ☒ b. Pilocytic astrocytoma
- c. Oligodendroglioma
- d. Glioblastoma

26. “Onion bulb” appearance of peripheral nerves is characteristic of:

- a. Guillain–Barré syndrome
- ☒ b. Charcot–Marie–Tooth disease
- c. Myasthenia gravis
- d. CIDP

27. Most common cause of non-traumatic subarachnoid hemorrhage:

- a. AVM
- b. Amyloid angiopathy
- ☒ c. Berry aneurysm rupture
- d. Hypertensive hemorrhage



28. Which organism is the most common cause of bacterial meningitis in adults?

- a. *Listeria monocytogenes*
- b. *E. coli*
- ☒ c. *Streptococcus pneumoniae*
- d. *Neisseria meningitidis*

29. Psammoma bodies are most commonly seen in:

- ☒ a. Meningioma
- b. Medulloblastoma
- c. Pilocytic astrocytoma
- d. Schwannoma

30. Hallmark feature of Pick disease:

- a. Neurofibrillary tangles
- ☒ b. Tau inclusions
- c. Lewy bodies
- d. Prion plaques

31. Thrombotic strokes most commonly occur due to:

- a. Charcot–Bouchard aneurysm rupture
- ☒ b. Atherosclerotic plaque rupture
- c. Cardiac emboli
- d. Middle meningeal artery trauma

32. Which is characteristic of Guillain–Barré syndrome?

- a. Autoimmune destruction of ACh receptors
- b. Loss of anterior horn cells
- ☒ c. Ascending paralysis with demyelination
- d. Central demyelination

33. Which condition involves degeneration of both upper and lower motor neurons?

- a. Guillain–Barré syndrome
- b. Myasthenia gravis
- ☒ c. Amyotrophic lateral sclerosis
- d. Multiple sclerosis

34. Which CNS tumor often shows "fried-egg" appearance of cells?

- ☒ a. Oligodendroglioma
- b. Meningioma
- c. Glioblastoma
- d. Medulloblastoma

35. Which neurodegenerative disorder shows atrophy of the caudate nucleus?

- a. Alzheimer disease
- b. Wilson disease
- c. Parkinson disease
- ☒ d. Huntington disease

36. Subdural hematoma results from rupture of:

- a. Circle of Willis aneurysm
- b. Dural venous sinuses
- ☒ c. Bridging veins
- d. Middle meningeal artery

37. Most characteristic molecular alteration in primary glioblastoma:

- ☒ a. EGFR amplification
- b. BRAF V600E mutation
- c. IDH1 mutation
- d. 1p/19q co-deletion

38. A child with a cerebellar tumor composed of small, round blue cells most likely has:

- a. Schwannoma
- b. Pilocytic astrocytoma
- c. Ependymoma
- ☒ d. Medulloblastoma

39. The most typical cause of intraparenchymal hemorrhage in the elderly is:

- a. Berry aneurysm rupture
- b. Trauma
- ☒ c. Hypertension
- d. Amyloid angiopathy

40. Tumor arising from Rathke pouch remnants:

- a. Meningioma
- ☒ b. Craniopharyngioma
- c. Pinealoma
- d. Pituitary adenoma

41. Enzyme responsible for termination of acetylcholine action:

- a. Tyrosine hydroxylase
- b. Reuptake transporter
- ☒ c. Acetylcholinesterase
- d. Monoamine oxidase

42. Primary difference in life cycle of epinephrine compared to norepinephrine:

- a. Synthesized directly from dopamine
- ☒ b. Converted from norepinephrine in adrenal medulla
- c. Terminated by AChE
- d. Not stored in vesicles

43. Primary function of the sympathetic nervous system:

- a. Voluntary skeletal movement
- b. Energy conservation and digestion
- ☒ c. Stress response and cardiovascular regulation
- d. Sensory processing

44. Clozapine is classified as:

- a. Typical antipsychotic
- ☒ b. Atypical antipsychotic
- c. Antidepressant
- d. Anxiolytic

45. Drug class primarily used to treat generalized anxiety disorder:

- a. Antipsychotics
- b. Antiepileptics
- c. Barbiturates
- ☒ d. Benzodiazepines

46. Opioid antagonist with long duration used for relapse prevention:

- ☒ a. Naltrexone
- b. Naloxone
- c. Methadone
- d. Tramadol
- e. Buprenorphine

47. SSRIs primarily act by:

- ☒ a. Blocking serotonin reuptake
- b. Enhancing serotonin degradation
- c. Blocking serotonin synthesis
- d. Preventing receptor binding

48. Which opioid is a partial μ -agonist and κ -antagonist?

- a. Naloxone
- b. Morphine
- ☒ c. Buprenorphine
- d. Methadone
- e. Fentanyl

49. Which benzodiazepine has a long half-life?

- a. Lorazepam
- b. Alprazolam
- ☒ c. Diazepam
- d. Midazolam

50. A potent μ -receptor agonist used for severe pain:

- a. Naloxone
- ☒ b. Morphine
- c. Nalbuphine
- d. Buprenorphine
- e. Pentazocine

51. Which opioid causes histamine release and hypotension?

- a. Tramadol
- b. Methadone
- ☒ c. Morphine
- d. Fentanyl
- e. Buprenorphine

52. Antiepileptic drugs control seizures by:

- a. Inhibiting serotonin reuptake
- b. Increasing dopamine
- c. Blocking acetylcholine receptors
- ☒ d. Enhancing inhibitory neurotransmission

53. Opioid with highest potency and rapid onset:

- a. Tramadol
- b. Codeine
- c. Methadone
- ☒ d. Fentanyl
- e. Morphine

54. A common adverse effect of neuroleptics is:

- ☒ a. Extrapyrimaldal symptoms
- b. Insomnia
- c. Tachycardia
- d. Hypotension

55. Final Krebs cycle intermediate in GABA metabolism:

- a. Glutamate
- ☒ b. Succinate
- c. Oxaloacetate
- d. α -ketoglutarate

56. Intermediate cleaved to produce gamma-lipotropin and beta-endorphin:

- a. ACTH
- b. Met-enkephalin
- ☒ c. Beta-lipotropin
- d. Alpha-MSH

57. Primary location of final synthesis of small-molecule neurotransmitters and enzyme transport method:

- a. Presynaptic terminal; fast transport
- b. Cell body; used locally
- ☒ c. Presynaptic terminal; slow transport
- d. Postsynaptic terminal; diffusion

58. Generation of Substance P and Neurokinin A from one gene occurs via:

- a. Alternative splicing
- b. Post-translational amidation
- ☒ c. Differential proteolytic cleavage
- d. Gene duplication

59. Vancomycin is the drug of choice for acute pneumococcal meningitis.

- a. True
- ☒ b. False

?

60. An 8-year-old boy with suspected meningitis: CSF Gram stain most likely shows:

- a. Many leukocytes and gram-negative bacilli
- b. Few leukocytes, increased glucose, gram-negative diplococci
- c. Many leukocytes and gram-positive bacilli
- d. Many leukocytes and gram-positive cocci in clusters
- e. Few leukocytes, increased glucose, gram-positive diplococci
- ☒ f. None of the answers is correct
- g. Many leukocytes and gram-positive branching rods

61. Winterbottom's sign is seen in infection caused by:

- a. *Trypanosoma cruzi*
- ☒ b. *Trypanosoma brucei gambiense*
- c. *Toxoplasma gondii*
- d. *Trypanosoma brucei rhodesiense*
- e. *Naegleria fowleri*
- f. *Leishmania major*

62. What is the biological vector for African sleeping sickness?

- a. Ticks
- b. Deer tick
- ☒ c. Tsetse fly
- d. Bugs
- e. Mosquito
- f. Sand fly

63. 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, II, 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

64. A 23 year old man is brought to the emergency room from the site of an automobile collision. The neurological examination reveals weakness of the right lower extremity and a loss of pain and thermal sensations on the left side beginning at the level of the umbilicus. CT shows a fracture of the vertebral column with displacement of bone fragments into the vertebral canal. Which of the following represents the most likely level of damage to the spinal cord resulting from the fracture to the vertebral column in this man?

- a. T10 on the left
- b. T8 on the left
- c. T10 on the right
- d. T6 on the left
- ☒ e. T8 on the right

65. Regarding pyramidal tracts:

- a. All skeletal muscle have dual supply from this tract
- ☒ b. Fibers are mainly crossing the midline.
- c. None of the above.
- d. Mainly inhibitory to the muscle tone

66. A 57-year-old obese man is brought to the emergency department by his wife. The examination reveals that cranial nerve function is normal but the man has bilateral weakness of his lower extremities. He has no sensory deficits. MRI shows a small infarcted area in the general region of the cervical spinal cord-medulla junction. Which of the following represents the most likely location of this lesion?

- a. Rostral part of the pyramidal decussation
- b. Lateral corticospinal tract on the left
- ☒ c. Caudal part of the pyramidal decussation
- d. Pyramids bilaterally
- e. Pyramid on the right

67. Ganglion cells attached to photoreceptors located on the temporal portion of the retina project to which of the following structures?

- ☒ a. Ipsilateral lateral geniculate nucleus
- b. Ipsilateral medial geniculate nucleus
- c. Calcarine fissure
- d. Contralateral lateral geniculate nucleus
- e. Contralateral medial geniculate nucleus

68. All of the following arteries are branches of the basilar artery except the:

- a. Pontine Arteries
- b. Posterior Cerebral Artery
- c. Superior Cerebellar Artery
- ☒ d. Middle Cerebral Artery

69. The integrity of the trigeminal (V) cranial nerve can be determined by asking the patient to:

- a. Close eyes tightly
- b. Protrude the tongue
- c. Puff out the cheeks
- ☒ d. Open the jaw against resistance

70. The precentral gyrus and corticospinal tract are essential for which of the following

- a. Vision
- b. Auditory Identification
- ☒ c. Voluntary movement
- d. Olfaction

71. Which of the following maneuvers will attenuate the stretch reflex in skeletal muscle?

- a. Disruption of the corticospinal tract
- b. Sectioning the medial lemniscus on the contralateral side of the skeletal muscle in question
- ☒ c. Sectioning the dorsal root of a spinal nerve
- d. Creating a lesion in the contralateral globus pallidus
- e. Disruption of the spinocerebellar tract

72. This contains only sensory axons that conduct nerve impulses from sensory receptors in the skin, muscles and internal organs into the CNS.

- a. Spinal nerves
- b. Cauda equina
- c. Central canal
- ☒ d. Posterior root

ملاحظة

في موقع من الروابط

في سؤاله من هالمسائل

وامه حلول صح posterior root

وراحه محلول غلط

73. Gyri are made because

- a. The cerebellum grows faster than the cerebrum
- ☒ b. The gray matter grows faster than the white matter
- c. The white matter enlarges faster than the gray matter
- d. The hypothalamus is larger than the epithalamus
- e. The lobes of the cerebellum are not symmetrical

74. This is a narrow cavity along the midline superior to the hypothalamus and between the right and left halves of the thalamus.

- a. Fourth Ventricle
- b. Corpus callosum
- c. Lateral Ventricle
- d. Septum Pellucidum

☒ e. Third Ventricle

75. A 79~year old man is experiencing peripheral nerve damage of his lower right limb. Which of the following is characteristic of lower motor neuron damage?

- a. Spastic paralysis
- b. Hyperreflexia
- ☒ c. Hyporeflexia
- d. Increased tone
- e. Increased muscle mass

76. Arachnoid villi:

- a. Are part of the true dura
- b. Are an integral part of the sigmoid sinus
- c. Are situated in the spinal cord
- ☒ d. Pass cerebrospinal fluid to the venous system
- e. Produce cerebrospinal fluid

77. Fracture of the L4 vertebra will cause impingement to the:

- a. T12 spinal segment
- ☒ b. Cauda equina
- c. L4 spinal segment
- d. L1 nerve root
- e. L2 spinal segment

78. Which of the following does not match between an artery and its branch?

- a. Anterior cerebral/ anterior communicating
- b. Vertebral/ anterior spinal
- c. Ophthalmic/ anterior ethmoidal
- d. Internal carotid/ posterior communicating
- ☒ e. Basilar/ posterior inferior cerebellar

79. One of the following is not derived from the neural crest:

- a. Spinal ganglia.
- b. Arachnoid mater.
- c. Schwann cells.
- d. Pia mater.
- ☒ e. Dura mater

80. A 34-year old man is rushed to the emergency room from the site of a car accident. An MRI reveals a lesion at the level of the midbrain. His upper and lower limbs are extended. Name (i) the type of rigidity and (ii) the tract/tracts involved in the extension of the limbs.

- a. Decorticate; Medial reticulospinal and lateral vestibulospinal tract
- b. Decorticate; Rubrospinal tract
- c. Decerebrate; Rubrospinal tract
- d. Decerebrate; Rubrospinal and lateral vestibulospinal tract

☒ e. Decerebrate; Medial reticulospinal and lateral vestibulospinal tract

81. A patient with a cerebellar stroke has received functional balance training for 4 weeks. Which of the following tests is MOST appropriate to measure the effectiveness of the physical therapy intervention?

- a. Fugl-Meyer assessment
- b. Barthel index

☒ c. Berg balance scale

- d. Romberg test

82. Communication with a patient with Broca's Aphasia has made the rehabilitation process difficult. In this case, it would be best if:

- a. Use non verbal communication or symbolic gestures
- b. You respond to the patient in writing

☒ c. Oral communication such that the patient can respond to yes or no answers

- d. The patient responds to you in writing

هناك حل
الموقع
انا غير
متأكد

83. Which compartment of the cochlea contains the organ of Corti?

- a. Scala tympani
- b. Ampulla
- c. Sacculle
- d. Scala vestibuli

e. Scala media



84. department after experiencing sudden onset of weakness of his left upper and lower extremities. CT shows an infarcted area in the medulla. Damage to which of the following tracts or fiber bundles of the medulla would most likely explain this deficit?

- a. Rubrospinal tract
- b. Corticospinal fibers**
- c. Vestibulospinal fibers
- d. Anterolateral system
- e. Medial Lemniscus

See →

Correct Nicely done!

5. A 54-year-old morbidly obese and hypertensive man is brought to the emergency department after experiencing sudden onset of weakness of his left upper and lower extremities. CT shows an infarcted area in the medulla. Damage to which of the following tracts or fiber bundles of the medulla would most likely explain this deficit?

- ☐ Anterolateral system
- ☒ Corticospinal fibers
- ☐ Medial Lemniscus
- ☐ Rubrospinal tract
- ☐ Vestibulospinal fibers

85. A 47-year-old man is transported to the emergency department from the site of an automobile collision. The examination reveals a paralysis of both lower extremities. Which of the following most specifically identifies this clinical picture?

- a. Hemiplegia
- b. Paraplegia**
- c. Quadriplegia
- d. Monoplegia
- e. Alternating hemiplegia

86. Which of the below responses is NOT caused by the sympathetic division.

- a. Increase blood flow to skeletal and cardiac muscle, liver, and fat
- b. Increase blood glucose level
- c. Decrease blood flow to kidneys and gastrointestinal tract
- d. Increased heart rate

☒ e. Airway constriction

87. One of the following is not derived from the neural crest:

- a. Geniculate ganglion of the facial nerve.
- ☒ b. Suprarenal cortex.
- c. Sympathetic chain.
- d. Dorsal root ganglia.
- e. Gracile tract.

88. The following are parts of the hypothalamus except:

- a. Paraventricular nucleus
- ☒ b. Pineal body
- c. Suprachiasmatic nucleus
- d. Supraoptic nucleus
- e. Mamillary body

89. Upon physical examination of a CVA patient, you noted that px has spasticity of left triceps surae. Spasticity is described as an increased in tone manifested by a catch. Based on Ashworth Scale, this should be graded as;

- a. Grade 3
- ☒ b. Grade 1
- c. Grade 2
- d. Grade4

90. In the neurological exam, confrontational testing, with the patient fixating on the examiner's nose, is used to determine:

- a. The status of the retinal vasculature
- b. Visual acuity
- c. Color vision

☒ d. The integrity of the visual fields

91. Inductive signals, generated by the activity of specific genes, are responsible for the differentiation of all of the following cell types except:

- a. Neurons
- b. Oligodendrocytes.
- c. Astrocytes

☒ d. Ependymal

92. A 23 year old man is brought to the emergency room from the site of an automobile collision. The neurological examination reveals weakness of the right lower extremity and a loss of pain and thermal sensations on the left side beginning at the level of the umbilicus. CT shows a fracture of the vertebral column with displacement of bone fragments into the vertebral canal. Damage to which of the following tracts would correlate with weakness of the lower extremity in this man?

- a. Left lateral corticospinal tract
- b. Right rubrospinal tract
- c. Vestibulospinal fibers on the right
- d. Reticulospinal fibers on the right

☒ e. Right lateral corticospinal tract

93. Which of the following functional areas of the cerebrum is responsible for speech.

- a. Primary somatosensory area
- b. Common integrative area
- ☒ c. Broca's Area
- d. Primary Gustatory
- e. Prefrontal cortex area

94. Which of the following projection systems is contained in the superior cerebellar peduncle?

- a. Pontocerebellar
- b. Posterior spinocerebellar
- c. Corticospinal

☒ d. Cerebellothalamic

95. Damage of the posterior cerebral artery will produce what symptoms?

- a. Paralysis of the lower extremity
- b. Weakness of the arms, trunk, and face

☒ c. Visual problem

- d. Pure sensory impairment
- e. Deviation of the face

96. During the interview process, the pt. has intact verbal expression, but is unable to comprehend the words correctly. This type of communication disorder is BEST termed:

- a. Global
- b. Conduction
- c. Broca's

☒ d. Wernicke's

ملاحظة) هذا السؤال في موقع
منه الروابط محلولة غلط

97. The purkinje cell conveys the only output from the cerebellar cortex and projects inhibitory output GABA to the cerebellar and vestibular nuclei.

a. False

☒ b. True

98. The secretomotor parasympathetic nerve fiber of the facial nerve exits at the:

a. Cribriform plate

☒ b. Stylomastoid foramen

c. Foramen rotundum

d. Foramen ovale

e. Superior orbital fissure

99. While evaluating the pt., the PT instructed the pt. To whistle. Pt. was not able to whistle on command, but you have heard him whistling while listening to the music. The same patient is unable to walk in the gym after demonstration, but is observed walking across the room. This conditioned is termed as:

☒ a. Ideomotor apraxia

b. Ideational apraxia

c. Constructional apraxia

d. Dressing apraxia

e. Limb kinetic apraxia

100. Which of the following is the middle ear ossicle that is attached to the tympanic membrane?

☒ a. Malleus

b. Incus

c. Stapes

d. Columella

e. Modiolus

101. Which of the following statements about trophic interactions is incorrect?

- a. Trophic interactions determine the size of neuronal populations during development.
- b. Trophic interactions occur between presynaptic neurons and postsynaptic neurons.
- c. Trophic interactions are mediated by trophic substances called neurotrophins.
- ☒ d. Trophic interactions no longer play a role in neuron survival and function in the adult nervous system

102. Which of the following examination findings would be expected in a patient who also had sustained ankle clonus?

- a. Hyporeflexia when deep tendon reflexes are elicited in the lower leg
- b. Weakness of ankle plantar flexors with one repetition strength testing
- ☒ c. An upgoing great toe when the sole of the foot is stroked
- d. Absence of sensation to sharp/dull testing over the posterior lower leg

103. 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
- b. +1
- c. +0.10
- d. +0.01
- ☒ e. +100

104. Basal ganglia inhibits cortical output that produces competing or ineffective motor behaviors.

- ☒ a. True
- b. False

105. Based on their relative locations in the spinal cord, which of the following tracts or fiber bundles would most likely be involved in a lesion located in the immediate vicinity of the lateral corticospinal tract?

- a. Anterior spinocerebellar tract
- b. Anterolateral system
- c. Gracile fasciculus
- d. Medial longitudinal fasciculus

☒ e. Rubrospinal tract

106. As a medical student, you are tapping the patellar tendon to activate the knee jerk reflex. The resulting reflex is within a normal range. Which sensory organ is activated in response to this stimulus?

a. Golgi tendon organ

☒ b. Muscle spindle

c. Ruffini ending

d. Merkel cell

e. Pacinian corpuscle

107. The fibers of the corticospinal tract pass through which one of the following structures?

a. Anterior roots

b. Medial longitudinal fasciculus

☒ c. Medullary pyramid

d. Medial lemniscus

e. Posterior funiculus

108. A stroke involving the middle cerebral artery on the left side is likely to cause which of the following symptoms?

- a. Paralysis of left lower extremity
- b. Paralysis of left side of face and left upper extremity
- c. Loss of vision in left half of both eyes
- d. Complete loss of vision in both eyes
- ☒ e. Loss of ability to comprehend speech

109. Damage to the efferent portion of the muscle spindle would involve which of the following fiber types?

- a. AB fibers
- b. C fibers
- ☒ c. A γ fibers
- d. A α fibers
- e. B fibers

110. A 52-year-old woman who is unable to move her left leg visits your office. Sensory modalities in all of her limbs are retained and there appears to be no sign of weakness in any of her other limbs. In which of the following structures are the cell bodies of lower motor neurons innervating the lower limb located?

- a. Lamina I, II
- b. Lamina III, IV
- c. Lamina I-VI
- ☒ d. Lamina VIII, IX
- e. Lamina X

111. Signals from motor areas of the cortex reach the contralateral cerebellum after first passing through which one of the following structures?

- a. Thalamus
- ☒ b. Basilar pontine nuclei
- c. Caudate nucleus
- d. Red nucleus
- e. Dorsal column nuclei

112. A 22-year-old woman is suffering from bilateral weakness of her lower limbs. Which of the following represents the most likely location of this lesion?

- a. The right genu of the internal capsule
- b. The left genu of the internal capsule
- c. The right posterior limb of the internal capsule
- ☒ d. A lesion caudal to the pyramidal decussation
- e. A lesion rostral to the pyramidal decussation

113. While talking to a CVA pt. He has difficulty in uttering words but understands what you are saying. Which of the following aphasic syndromes has impaired fluency?

- a. Wernicke's
- ☒ b. Broca's
- c. Global
- d. Conduction

114. A 3-year-old child with café-au-lait spots and optic gliomas most likely has:

- a. Von Hippel–Lindau disease
- ☒ b. Neurofibromatosis type 1
- c. Tuberous sclerosis
- d. Neurofibromatosis type

115. Which finding is characteristic of an epidural hematoma?

- ☒ a. Lens-shaped (biconvex) hemorrhage
- b. Rupture of bridging veins
- c. Crescent-shaped hemorrhage
- d. Gradual onset of symptoms over weeks

116. The most common primary malignant brain tumor in children is:

- a. Glioblastoma
- ☒ b. Medulloblastoma
- c. Ependymoma
- d. Pilocytic astrocytoma

117. The “onion bulb” appearance of peripheral nerves is most characteristic of:

- a. Guillain–Barré syndrome
- b. Myasthenia gravis
- ☒ c. Charcot–Marie–Tooth disease
- d. Chronic inflammatory demyelinating polyneuropathy (CIDP)

118. Subdural hematoma results from rupture of:

- a. Dural venous sinuses
- b. Circle of Willis aneurysm
- ☒ c. Bridging veins
- d. Middle meningeal artery

119. Which condition is associated with “flame-shaped” astrocytes (Rosenthal fibers)?

- ☒ a. Pilocytic astrocytoma
- b. Glioblastoma
- c. Oligodendroglioma
- d. Meningioma

120. Progressive multifocal leukoencephalopathy (PML) is caused by reactivation of:

- a. HSV-1
- b. EBV
- ☒ c. JC virus
- d. CMV

121. ☺ Sorry

122. Which one of the following is a correct match between the drug and its side effect?

- a. Levodopa: compulsive behaviour
- ☒ b. Pergolide: heart valve fibrosis
- c. Pramipexole: phenomenon
- d. Rasagiline: increased excitement

123. One of the causative agents of subacute/chronic meningitis is Tuberculosis. Each of the following statements concerning the causative agent “Mycobacterium tuberculosis” is correct EXCEPT:

- a. Some strains of M. Tuberculosis isolated from patients exhibit multiple drug resistance (i.e., they are resistant to both isoniazid and rifampin)
- b. Mycobacterium tuberculosis contains a large amount of lipid in its cell wall and therefore stains poorly with the Gram stain
- ☒ c. None of the answers can be excepted
- d. Mycobacterium tuberculosis grows slowly, often requiring 3 to 6 weeks before colonies appear
- e. The antigen in the tuberculin skin test is a protein extracted from the organism

124. Tetanospasmin toxin that produced by Clostridium tetani acts through:

- ☒ a. Blocking the release of an inhibitory mediator in motor neuron synapses
- b. Lecithinase destroying cell membrane
- c. ADP-ribosylation causing increasing in c-AMP
- d. Inhibiting peptide chain Elongation Factor-2
- e. Blocking the release of acetylcholine at synapses
- f. Stimulating lymphocytes to produce large amount of mediators as IL-1 & TNF

125. 64-year old woman presents with headache, lethargy and occasional vomiting, all suggestive of increased intracranial pressure. She also has marked weakness on the left side of her body. An MRI is performed which reveals a glioma invading the white matter between the lenticular nucleus and the thalamus on the right side of her brain. Which of the following is being compressed by this tumor?

- a. Corticopontine tract
- b. Anterior commissure
- ☒ c. Posterior limb of internal capsule
- d. Posterior commissure
- e. Anterior limb of internal capsule

126. The 3rd ventricle is the cavity of the:

- a. Telencephalon.
- b. Mesencephalon.
- c. Metencephalon.
- d. Myelencephalon.
- ☒ e. Diencephalon.

127. Following a motor bike accident, a 22-year old man presents with paraplegia. Name (i) the tract affected (ii) the site of injury and (iii) the type of lesion.

a. Corticospinal tract, rostral to the decussation of pyramids, bilateral.

☒ b. Corticospinal tract, thoracic, bilateral.

c. Spinothalamic, thoracic, unilateral.

d. Corticospinal tract, posterior limb, unilateral.

e. Corticobulbar tract, genu of internal capsule, bilateral.

128. Which of the following substances will elicit the sensation of bitter taste?

a. Hydrogen ions

b. Amino acids

c. Aldehydes

☒ d. Alkaloids

e. Ketones

129. Knowing the cerebral dominance resulting in right hemisphere damage. The patient will most likely exhibit

a. Negative, self-deprecating comments and frequent depression

b. Language problems

☒ c. Poor judgement with increased safety

d. Slow, cautious behaviors

e. Hesitancy, requiring more feedback and support

130. The condition of cataracts is usually the result of which of the following processes or conditions?

- ☒ a. Coagulation of the proteins in the lens of the eye
- b. Increase in intraocular pressure
- c. Denaturation of the proteins in lens of the eye
- d. Elongated eye globe
- e. Unresponsive and dilated pupil

131. The motor area for speech usually lies in which gyrus?

- a. Inferior temporal gyrus of the left hemisphere
- b. Superior frontal gyrus of the right hemisphere
- c. Superior frontal gyrus of the left hemisphere
- ☒ d. Inferior frontal gyrus the left hemisphere
- e. Inferior frontal gyrus of the right hemisphere

132. In early embryogenesis, the notochord develops in the midline from the:

- ☒ a. Mesoderm
- b. Ectoderm
- c. Neural Tube
- d. Floorplate

133. The creation of memory can be interrupted by which of the following activities?

- a. Activation of cGMP phosphodiesterase
- b. Phosphorylation of a potassium channel to block activity
- ☒ c. Unnatural loss of consciousness
- d. Increase in protein synthesis
- e. Activation of adenylate cyclase

134. The lateral ventricle communicates with the 3rd ventricle through:

- a. Aqueduct of Sylvius.
- b. Central canal.
- c. Foramen of Magendie.
- ☒ d. Foramen of Monro.
- e. Foramen of Luschka.

135. This is the major relay station for most sensory impulses that reach the primary somatosensory areas of the cerebral cortex from the brain stem and the spinal cord.

- a. Epithalamus
- b. Pons
- c. Midbrain
- ☒ d. Thalamus
- e. Hypothalamus

136. A 67-year-old patient is recovering from a left CVA. He is wearing a plastic knee-ankle-foot orthosis to stabilize his right foot. During gait analysis you observe lateral trunk bending toward the right as he bears weight on the right leg at midstance. The best treatment choice to correct this problem is:

- a. Provide a lift on the shoe of the involved leg
- b. Strengthen hip flexors on the right side
- c. Strengthen hamstrings on the right side
- ☒ d. Strengthen the hip abductors on the right side

137. 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. Parallel light rays passing through a convex lens will converge at a focal point equal to the focal length of that lens
- c. The image produced by a convex lens is right side up, but its two lateral sides are reversed with respect to the object
- d. Diverging light rays passing through a convex lens will converge at a focal point closer than the focal length of that lens
- e. The lens with the greatest convexity will have the longest focal length

138. 44-year old man presents with a "cape-like" loss of sensation (pain and temperature) to his back and arms. An MRI reveals a cyst at the cervical level of his spinal cord. Name (i) the disorder and (ii) the tract that is affected.

- a. Brown Sequard syndrome, Corticospinal tract
- ☒ b. Syringomyelia, Spinothalamic tract
- c. Syringomyelia, Tectospinal tract
- d. Syringomyelia, Corticospinal tract
- e. Brown Sequard syndrome, Spinothalamic tract

139. Which of the following statements regarding the lateral geniculate nucleus is correct?

- a. Layer four receives signals from Y ganglion cells
- b. Layer one receives signals from the lateral half of the retina
- c. Layer one is called a parvocellular layer
- ☒ d. Layer one receives signals that originate from rods
- e. Layer four receives signals from the ipsilateral retina

140. A 57-year-old man presents with hoarseness. The neurological examination reveals a deviation of the uvula to the left on phonation, deviation of the tongue to the right on protrusion, and weakness of the facial muscles around the mouth on the right. Which of the following would most likely also be seen in this man?

- a. Inability to shrug the right shoulder against resistance
- b. Inability to turn his head to the right against resistance
- c. Weakness of the masticatory muscles on the right
- d. Weakness of the masticatory muscles on the left
- ☒ e. Inability to turn his head to the left against resistance

141. Which statement about the early precursor cells of the neural tube is incorrect?

- ☒ a. The cell nuclei move closest to the lumen of the neural tube during the period of DNA replication (S phase).
- b. The cells lose contact with the pial surface during mitosis.
- c. The cells form a pseudostratified columnar epithelium.
- d. The cells extend between the pia and the lumen of the neural tube.

142. Which of the following statements regarding the cranial nerve innervation of the tongue is correct?

- a. Taste information from the posterior third of the tongue initially travels with the chorda tympani nerve
- b. Taste information from the anterior two-thirds of the tongue is transmitted to the solitary nucleus by the glossopharyngeal 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 pharynx is transmitted to the solitary nucleus by the facial nerve

143. The secondary embryonic brain vesicle that gives rise to the pons and cerebellum is the:

- a. Myelencephalon
- ☒ b. Metencephalon
- c. Telencephalon
- d. Mesencephalon

144. 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. Dark pigment that prevents the reflection of light inside the globe of the eye
- c. Light reflected off the melanin pigment is a key element used in the process of accommodation of the lens
- d. Responsible for maintaining integrity of the canal of Schlemm
- e. Serves as nutritional component for the rods and cones in the retina

145. The following statements concerning the thalamus are correct except:

- a. It is the largest part of the diencephalons and serves as a relay station to all the main sensory tracts (except the olfactory pathway)
- ☒ b. It forms the anterior boundary of the interventricular foramen
- c. It is separated from the lentiform nucleus by the internal capsule
- d. It may be joined to the thalamus on the opposite side
- e. The gray matter of the thalamus is divided by a vertical sheet of white matter called the internal medullary lamina

146. Which is NOT considered a major part of the brain?

- a. Brainstem
- b. Cerebrum
- c. Diencephalon
- ☒ d. Cauda Equina
- e. Cerebellum

147. Which of the following is the most common cause of non-traumatic subarachnoid hemorrhage?

- a. Amyloid angiopathy
- b. Arteriovenous malformation
- ☒ c. Saccular (berry) aneurysm rupture
- d. Hypertensive intracerebral hemorrhage

148. Which tumor classically presents with perivascular pseudorosettes?

- a. Schwannoma
- ☒ b. Ependymoma
- c. Pilocytic astrocytoma
- d. Medulloblastoma

149. Which of the following is a hallmark lesion of Parkinson disease?

- ☒ a. Lewy bodies
- b. Amyloid plaques
- c. Pick bodies
- d. Rosenthal fibers

150. Which of the following is characteristic of Guillain–Barré syndrome?

- a. Loss of anterior horn cells
- b. Autoimmune destruction of acetylcholine receptors
- ☒ c. Ascending paralysis with peripheral demyelination
- d. Central demyelination

151. Multiple sclerosis characteristically shows which of the following features?

- a. Loss of upper motor neurons in the cortex
- b. Antibody-mediated destruction of neuromuscular junction
- ☒ c. Demyelination with relative preservation of axons
- d. Neuronal degeneration in caudate nucleus

152. Thrombotic strokes most commonly occur due to:

- ☒ a. Atherosclerotic plaque rupture in cerebral vessels
- b. Trauma to the middle meningeal artery
- c. Rupture of Charcot–Bouchard aneurysms
- d. Embolism from the heart

153. meningioma is most commonly derived from which cell type?

- a. Astrocytes
- ☒ b. Arachnoid cap cells
- c. Schwann cells
- d. Oligodendrocytes

154. What is the role of Monoamine Oxidase (MAO) in the life cycle of Norepinephrine (NE)?

- a. It promotes the release of NE into the synaptic cleft.
- b. It synthesizes NE from tyrosine precursors.
- ☒ c. It inactivates NE after reuptake into vesicles.
- d. It converts NE into Epinephrine (Epi)

155. Which drug is used to reduce skeletal muscle spasms?

- a. Atropine
- b. Amitriptyline
- ☒ c. Diazepam
- d. Fluoxetine

?

156. What is the primary therapeutic target for terminating synaptic transmission?

- a. Stimulating beta-2 receptors
- b. Increasing dopamine levels
- c. Enhancing acetylcholine release
- ☒ d. Blocking MAO or reuptake

157. The drug used to reverse benzodiazepine overdose is:

- ☒ a. Flumazenil
- b. Naloxone
- c. Atropine
- d. Pralidoxime

158. Tricyclic antidepressants can cause which anticholinergic side effect?

- ☒ a. Blurred vision
- b. Increased salivation
- c. Diarrhea
- d. Bradycardia

159. What enzyme is primarily responsible for the rapid termination of Acetylcholine (ACh) action?

- a. Monoamine Oxidase (MAO)
- b. Reuptake Transporter
- ☒ c. Acetylcholinesterase (AChE)
- d. Tyrosine Hydroxylase

160. Neuroleptic drugs block dopamine receptors primarily in which pathway?

- a. Corticospinal
- ☒ b. Mesolimbic
- c. Nigrostriatal
- d. Autonomic

161. Why is understanding PNS pharmacology considered foundational in neuropharmacology?

- a. Because PNS pharmacology is more complex than CNS pharmacology
- b. Because PNS pharmacology only involves axonal conduction
- c. Because PNS pharmacology does not involve synaptic transmission
- ☒ d. Because CNS pharmacology is generally more complex than PNS pharmacology

162. Which drug is a non-selective β -blocker used in glaucoma to reduce aqueous humor production?

- a. Metoprolol
- b. Atenolol
- ☒ c. Timolol
- d. Propranolol
- e. Labetalol
- f. Propranolol

163. Which protein is specifically mentioned as being present in small synaptic vesicles (SSVs) but absent in large dense-core vesicles (LDCVs), making it a distinguishing marker?

- ☒ a. Synaptophysin
- b. G-protein
- c. Kinesin
- d. Prohormone convertase

164. What happens to glutamate after it is taken up by an astrocyte from the synaptic cleft as part of the glutamate–glutamine cycle?

- ☒ a. It is converted to glutamine by glutamine synthetase and then released for neuronal uptake
- b. It is degraded into succinate to enter the Krebs cycle within the astrocyte
- c. It is converted into GABA by glutamic acid decarboxylase within the astrocyte
- d. It is directly transported back to the presynaptic neuron to be repackaged into vesicles

165. Which statement accurately contrasts the appearance of vesicles containing small-molecule neurotransmitters with those containing neuropeptides under an electron microscope?

- a. Small-molecule vesicles are large and clear-cored, while neuropeptide vesicles are small and dense-cored
- b. Both appear as small, clear-cored vesicles
- ☒ c. Small-molecule vesicles are small (40–60 nm) and clear-cored, while neuropeptide vesicles are larger and electron-dense
- d. Both appear as large, dense-cored vesicles

166. The axonal transport of large dense-core vesicles (LDCVs) from the cell body to the nerve terminal is an active process. What molecular machinery is primarily responsible for this anterograde movement?

- ☒ a. Kinesin motors moving along microtubules
- b. Dynein motors moving along actin filaments
- c. Passive diffusion down the axon's concentration gradient
- d. Myosin motors moving along microtubules

167. All of the following are features of Pneumococci EXCEPT?

- a. On blood agar, Pneumococci form small alpha-hemolytic colonies
- b. Growth is inhibited by optochin
- c. The colonies are bile-soluble
- d. They can also be detected by using the quelling reaction with multitype antiserum
- ☒ e. They are seen as lancet-shaped gram-negative diplococci in Gram-stained smears
- f. None of the answers can be excepted

168. Tetanospasmin toxin that produced by Clostridium. Tetani acts through

- a. Stimulating lymphocytes to produce large amount of mediators as IL-1 & TNF
- b. Blocking the release of acetylcholine at synapses
- c. Activating the release of an inhibitory mediator in motor neuron synapses
- d. Inhibiting peptide chain Elongation Factor-2

☒ e. None of the answers is correct

169. Cryptococcus neoformans in a CSF sample from a case of fungal meningitis?

☒ a. Negative stain

- b. Acid-Fast stain
- c. Gram stain
- d. Fluorescent stain
- e. Giemsa stain
- f. Silver stain

170. A 70-year old woman is brought to the emergency department by members of the volunteer fire department of a small town. She primarily complains of weakness. The examination reveals a hemiplegia involving the left upper and lower extremities, sensory losses (pain, thermal sensations, and proprioception) on the left side of the body and face, and a visual deficit in both eyes. MRI shows an area of infarction consistent with the territory served by the anterior choroidal artery. The weakness of the extremities in this woman is most likely due to damage to which of the following?

a. Thalamocortical fibers to sensory cortex on the right

☒ b. Corticospinal fibers on the right

- c. Somatomotor cortex on the right
- d. Corticospinal fibers on the left
- e. Thalamocortical fibers to motor cortex on the right

171. Which of the following substances will elicit the sensation of sour taste?

- ☒ a. Hydrogen ions
- b. Ketones
- c. Amino acids
- d. Aldehydes
- e. Alkaloids

172. This structure is found at all levels of the spinal cord. It is associated with light touch, pain, and temperature sensation. This structure is also called the dorsomarginal nucleus

- a. Rexed lamina 6
- b. Rexed lamina III
- ☒ c. Rexed lamina I
- d. Rexed lamina II
- e. Rexed lamina 10

173. The portion of the ventricular system that is located within the midbrain is the

- a. Third Ventricle
- ☒ b. Cerebral Aqueduct
- c. Fourth Ventricle
- d. Lateral Ventricle

174. An epidural hematoma would most likely result from

- ☒ a. A tear in the middle meningeal artery due to a fractured parietal bone
- b. A tear in a cerebral vein passing from the subarachnoid space into the superior sagittal sinus
- c. A tear in the basilar artery
- d. An aneurism of the middle cerebral vein
- e. An aneurism of the middle cerebral artery

175. A 24-year-old woman is rushed to the hospital following severe head injuries. She is displaying a specific rigidity that is a result of lesions rostral to the red nucleus. What symptoms is she displaying?

- a. Weakness of the masticatory muscles.
- ☒ b. Upper limb flexion and lower limb extension
- c. Deviation of the tongue on protrusion
- d. Upper and lower limb extension
- e. Lower extremity weakness

176. Which of the following statements regarding the transmission of taste information from the tongue to the cerebral cortex is correct?

- a. Thalamic nucleus involved in the taste pathway is the dorsal medial nucleus
- ☒ b. Nerve fibers carrying taste information from the tongue synapse in the solitary nucleus
- c. Nerve fibers carrying taste information from the tongue have no synapse in the brainstem
- d. Majority of thalamic neurons in taste pathway synapse in the occipital lobe
- e. Thalamic nucleus involved in the taste pathway is the ventral posterolateral nucleus

177. A 28-year old women experiences drooping in her left lower facial muscles (below the eye). Her forehead remains unaffected. Given her symptoms name (i) the type of lesion (ii) the site of the lesion and (iii) the side of lesion

- a. Upper motor neuron lesion, posterior limb of internal capsule, left
- b. Upper motor neuron lesion, trigeminal nerve, right
- ☒ c. Upper motor neuron lesion, genu of internal capsule, right
- d. Lower motor neuron lesion, posterior limb of internal capsule, right
- e. Lower motor neuron lesion, facial nerve, left

178. Administration of a drug that blocks serotonin production will have which of the following effects on sleep?

- a. Rapid eye movement (REM) sleep will be blocked
- b. REM sleep will be immediately induced
- ☒ c. Sleep induction will be significantly prolonged or blocked
- d. Sleep induction will be almost immediate

179. Velocity of light in the substance: (Incorrect question) (the correct question is in the picture below)

- a. The refractive index of air is zero
 - b. When light waves strike a transparent solid, they always reflect away from the solid
3. 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

Reference: Guyton and Hall Physiology Review, Second edition

180. leading to night blindness? (Incomplete question) (the complete question is in the picture below)

- a. Vitamin E
- b. Vitamin D
- c. Vitamin A
- d. Vitamin K
- e. Vitamin C

22. 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

Reference: Guyton and Hall Physiology Review, Second edition