

INTEGRATIVE BIOLOGY 245: EXAMINATION #I
FEBRUARY 26, 2008

PLEASE CHOOSE THE BEST ANSWER:

1. Myelin, a lipoprotein covering an axon, begins at the _____ and ends short of the terminal.

- a. initial segment
- b. node of Ranvier, with its high density of Na⁺ gated channels
- c. axon hillock
- d. endoplasmic reticulum

2. Oligodendrocytes can myelinate

- a. only one dendrite
- b. only one axon
- c. many dendrites, as many as 50
- d. many axons, as many as 50

3. Schwann cells are a peripheral nervous system type of glia. Which is not true?

- a. a Schwann cell can myelinate more than one axon
- b. many Schwann cells myelinate one axon
- c. with more Schwann cells on the axon the faster the impulse
- d. Schwann cells form myelin in the PNS and oligodendrocytes form myelin in the CNS

4. The most common CNS neurotransmitter is

- a. acetylcholine
- b. glutamate
- c. dopamine
- d. norepinephrine

5. Dendritic spines are found on

- a. pyramidal dendrites
- b. all stellate dendrites
- c. other spines
- d. none of the above

6. Ependymal cells are a type of glial cell which

- a. line the ventricles
- b. cover CNS axons
- c. secrete HCL
- d. are not involved in cerebrospinal fluid formation

7. The most common type of glial cell is the
- a. oligodendrocyte
 - b. microglia
 - c. ependyma
 - d. astrocyte
8. Which is not true about microglia?
- a. they are phagocytic cells
 - b. they are formed in the bone marrow like a similar type of cell, a monocyte
 - c. they increase with Alzheimer's disease
 - d. they produce myelin
9. What is not a function of astrocytes?
- a. they have perivascular feet
 - b. they help form the pia/glial membrane
 - c. they destroy myelin
 - d. they pick up excess potassium after neuronal firing
10. A dorsal root ganglion consists of many
- a. pyramidal cells
 - b. stellate cells
 - c. bipolar cells
 - d. pseudounipolar cells
- ✓ 11. The region between the mesencephalon and metencephalon is called the
- a. sulcus limitans
 - b. basal plate
 - c. isthmus
 - d. choroid plexus
12. The roof of the IV ventricle does not include
- a. superior medullary velum
 - b. inferior medullary velum
 - c. pontine fibers
 - d. cerebellum
13. Cerebrospinal fluid is not formed in the
- a. posterior horn of the lateral ventricle
 - b. body of the lateral ventricle
 - c. inferior horn of the lateral ventricle
 - d. roof of the III ventricle

14. Cerebrospinal fluid is different from plasma in that it transports no
- sodium
 - lymphocytes
 - erythrocytes
 - chloride
15. The mesencephalon does not contain nerve cell bodies such as the
- oculomotor nucleus
 - hypoglossal nucleus
 - trochlear nucleus
 - third nerve nucleus
16. What term is not part of the corpora quadrigemina?
- tectum
 - superior colliculus
 - inferior colliculus
 - cerebral peduncles
17. The adrenal medulla, Schwann cells, dorsal root/spinal ganglia all develop from the
- mesencephalon
 - neural crest
 - diencephalon
 - telencephalon
18. Radial glial form _____ and later become astrocytes.
- a lining of the neural tube
 - a scaffolding for neural migration
 - a scaffolding of migrating glial cells
 - the developing neural tube
19. Protoplasmic astrocytes store
- lipid
 - glycogen
 - insulin
 - thyroid hormone
20. Which is incorrect for astrocytes?
- all processes are the same
 - do not generate electrical impulses
 - do form synapses
 - have foot processes

- ✓ 21. The lamina terminalis marks the
- a. rostral boundary of the telencephalon
 - b. rostral boundary of the diencephalon
 - c. caudal boundary of the midbrain
 - d. rostral boundary of the midbrain

22. What structure is not part of the epithalamus?
- a. pineal gland
 - b. pituitary gland
 - c. stria medullaris
 - d. habenular nucleus

g.

23. The posterior commissure, the superior colliculus and the occipital cortex are all associated with
- a. auditory functions
 - b. olfactory functions
 - c. visual functions
 - d. pain functions

24. Temperature regulation, thirst, appetite and emotions are all associated with what part of the neural tube?
- a. telencephalon
 - b. diencephalon
 - c. metencephalon
 - d. myelencephalon

25. The cerebral hemispheres do not include the
- a. archi/three layered cortex
 - b. hippocampus
 - c. dentate gyrus
 - d. thalamus

- ✓ 26. Which is not correct regarding the falx cerebri?
- a. attaches anteriorly to the crista galli
 - b. attaches posteriorly to the internal occipital protuberance
 - c. lies superior to the corpus callosum
 - d. is attached to the diaphragma sellae

27. A subdural hematoma lies between the
- a. meningeal dura and arachnoid
 - b. periosteal dura and meningeal dura
 - c. meningeal dura and pia
 - d. pia and arachnoid

28. A papilledema or choked disc can signify
- decreased function of the choroid plexus
 - an increase in blood pressure in the carotid artery
 - an increase in cerebrospinal fluid pressure in the ventricles
 - an enlarged aqueduct in the hindbrain
29. Which is not true about a cistern?
- consists of a separation between the dura and the arachnoid
 - consists of a separation between the arachnoid and the pia
 - one is found on the inferior surface of the cerebellum and dorsal surface of the medulla
 - one is found on the dorsal surface of the corpora quadrigemina
30. Arteries to the cerebrum lie on the
- arachnoid
 - meningeal dura
 - pia mater
 - an enlarged aqueduct in the hindbrain
31. Arachnoid granulations or villi are the site for
- CSF flow into the sub-pial space
 - venous blood to flow into the superior longitudinal sinus
 - arterial blood to gain access to the inferior longitudinal sinus
 - CSF to flow into the superior longitudinal sinus
32. The floor of the IV ventricle is formed by the
- cerebral peduncles
 - hypothalamus
 - pons (tegmentum) and medulla
 - ependyma and pia
33. Which is not a part of the path of flow of CSF?
- from the body of the lateral ventricle into the interventricular foramen (of Monro)
 - from inferior horn into the atrium/collateral trigone
 - from IV ventricle through the foramen of Magendie and foramen of Monro into the subarachnoid space
 - from the aqueduct into the IV ventricle
34. Which is not correct about the spinal cord?
- it terminates as the conus medullaris in the adult between vertebral levels L1 and L2.
 - it is attached to the coccyx by the filum terminale and to the dura by the denticulate ligaments between the dorsal and ventral nerve roots
 - the dorsal and ventral roots respectively enter and exit the dorsal and ventral horns in the cord
 - the spinal cord in the newborn reaches to the L5 vertebral level

35. Which is not a function of the CSF?
- serves as a cushion to protect the brain
 - allows the brain to float (buoyancy)
 - transports hormones and neurotransmitters
 - guides microglia into the nervous system
36. Which artery supplies Broca's area?
- posterior cerebral
 - anterior cerebral
 - middle cerebral
 - lateral cerebral
37. Which artery does not supply the cerebellum?
- posterior inferior cerebellar
 - middle cerebellar
 - superior cerebellar
 - anterior inferior cerebellar
38. Which artery supplies the choroid plexus of the III ventricle?
- superior cerebral
 - lateral cerebral
 - posterior cerebral
 - inferior cerebral
39. The major blood flow in the middle cerebral vein drains into the _____ sinus.
- transverse sinus
 - superior longitudinal sinus
 - cavernous sinus
 - straight sinus
40. Injury to the pontine arteries off the basilar artery can cause
- deafness
 - blindness
 - hoarseness
 - hemiplegia
41. A fairly common site of an aneurysm in the blood vessels
- junction of the anterior cerebral with the anterior communicating
 - close to the junction of the posterior communicating with the posterior cerebral
 - close to the junction of the posterior communicating with the internal carotid
 - at the junction of the posterior cerebrals

lab manual says

common

42. The ophthalmic artery supplying the retina is a branch of the
 a. internal carotid
b. external carotid
c. maxillary
d. posterior carotid
43. Occlusion of the posterior cerebral artery spares macular cortical vision because of an anastomosis with the
✓
a. internal carotid
b. anterior cerebral
 c. middle cerebral
d. lenticulostriates
44. The most common neurons in the central nervous system are
a. motor neurons
b. sensory neurons
c. bipolar neurons
 d. interneurons
45. A Golgi type I cell can be a
a. stellate cell
b. granule cells
 c. pyramidal cell
d. bipolar cell
46. Axon collaterals which leave the axon at the _____ can either ascend or descend
a. initial segment
b. presynaptic terminal
 c. node of Ranvier
d. myoneural junction
47. During chromatolysis, Nissl substance, which deals with protein synthesis, is displaced to the
a. periphery of the postsynaptic terminal
b. node of Ranvier
c. axon collateral
 d. periphery of the soma

48/, 49, 50 READ CASE . .

FOR EACH TYPE OF EPISODE IDENTIFY THE BRANCH OF THE INTERNAL CAROTID ARTERY THAT COULD BE RESPONSIBLE FOR THE PATIENT'S SYMPTOMS. AND THEN ANSWER EACH QUESTION CORRECTLY.

CASE 10.4 TRANSIENT EPISODES OF LEFT EYE-BLURRINESS, RIGHT HAND WEAKNESS, DIFFICULTY SPEAKING AND LACK OF RIGHT LEG CONTROL

A MINICASE: A 71 year-old -right -handed man with a long history of cigarette smoking and hypertension had an episode 5 months before admission of (48) right hand weakness and speech (48) difficulty "mixing up words". Since then, he has had several episodes lasting a few minutes each, of(49) dim blurry vision in the left eye. Finally, he fell on three separate occasions when (50) his right leg suddenly gave out, most recently on the day of admission. Examination was normal except for high-pitched abnormal sound (BRUIT) audible over the left carotid artery. (Each defective artery on left side.)

48. a. anterior cerebral artery
 (b.) middle cerebral artery
 c. posterior cerebral artery
49. a. anterior cerebral artery
 (b.) ophthalmic artery
 c. posterior cerebral artery
50. a. middle cerebral artery
 (b.) anterior cerebral artery
 c. posterior cerebral artery

THE GREATEST REWARDS COME FROM THE GREATEST COMMITMENTS

CASE 10.4 TRANSIENT EPISODES OF LEFT EYE BLURRINESS OR RIGHT HAND WEAKNESS

MINICASE

A 71-year-old right-handed man with a long history of cigarette smoking and hypertension had an episode 5 months before admission of **right hand weakness and speech difficulty "mixing up words"**. Since then, he has had several episodes, lasting a few minutes each, of **dim blurry vision in the left eye**. Finally, he fell on three separate occasions when his **right leg suddenly gave out**, most recently on the day of admission. Ex-

amination was normal except for a **high-pitched bruit audible over the left carotid artery**.

LOCALIZATION AND DIFFERENTIAL DIAGNOSIS

1. What is the most likely cause of this patient's transient neurologic episodes? What are some other possibilities?
2. For each type of episode shown in **bold** above, identify a branch of the internal carotid artery that could be responsible for the patient's symptoms.

Discussion

1. Given the patient's age and history of smoking and hypertension, atherosclerotic cerebrovascular disease is likely. The episodes lasted for a few minutes each and fit with a vascular anatomical pattern (see the localization discussion that follows) suggesting TIAs (see KCC 10.3). In addition, the **left carotid bruit** is a "smoking gun" that heightens the suspicion further for TIAs caused by left internal carotid stenosis. Other, less likely possibilities are listed in Table 10.2.
2. The three types of episodes in this case are:
 - **Right hand weakness and speech difficulty "mixing up words"**: Symptomatic branch of internal carotid = Left MCA superior division (see KCC 10.1).
 - **Right leg weakness**: Symptomatic branch of internal carotid = Left ACA (see KCC 10.1).
 - **Decreased vision in the left eye**: Symptomatic branch of internal carotid = Left ophthalmic artery (see KCC 10.5, 11.3).

Interestingly, unlike the case in this patient, internal carotid stenosis often causes TIAs mainly in one carotid branch, resulting in recurrent, nearly stereotyped episodes. For example, a patient may have several episodes of contralateral hand weakness, numbness, and tingling, or several episodes of transient monocular visual loss.

Clinical Course 401

Carotid Doppler studies showed a very tight stenosis of the left internal carotid artery. This was confirmed by MRA. The patient underwent an endarterectomy of the left internal carotid artery. In this procedure the carotid is temporarily cross-clamped, an incision is made in the artery, atherosclerotic plaque is carefully shelled out, and the artery wall is then stitched back together (see KCC 10.5). A large atheromatous plaque was removed in this patient, and when it was examined pathologically, it was found to have a residual lumen of only 0.1 cm in diameter. The patient did very well postoperatively, with no further episodes of weakness or vision changes.

Related Cases. Typical MRA findings in a different patient with critical stenosis of the right internal carotid artery are shown in Figure 10.16. This patient presented with two episodes, lasting 5 minutes each, of left hand numbness, tingling, and a feeling like it was not part of her body. A pathologic specimen from yet another patient removed at the time of carotid endarterectomy is shown in Figure 10.17.