

Multiple choice. Mark the one best answer of your choice (4 pts each).

1. Which of the following lists the meninges of the brain, from deep to superficial?
 - A. dura mater, arachnoid mater, pia mater
 - B. arachnoid mater, dura mater, pia mater
 - C. pia mater, arachnoid mater, dura mater
 - D. dura mater, pia mater, arachnoid mater
2. Which of the following ions is most directly responsible for neurotransmitter exocytosis?
 - A. sodium
 - B. acetylcholine
 - C. ATP
 - D. calcium
3. Which of the following structures is responsible for communication between the cerebral hemispheres?
 - A. basal nuclei
 - B. corpus callosum
 - C. transverse fissure
 - D. central gyrus
4. Which of the following affects the speed at which nerve impulses are conducted?
 - A. the number of presynaptic cells
 - B. the diameter of the axon
 - C. the number of neuron processes
 - D. the level of the threshold potential
5. Which of the following structures is responsible for the production of cerebrospinal fluid?
 - A. central canal
 - B. cerebral aqueduct
 - C. choroid plexus
 - D. arachnoid villus
6. Which of the following best describes the home of microglia?
 - A. autonomic nervous system
 - B. central nervous system
 - C. sensory division of the peripheral nervous system
 - D. motor division of the peripheral nervous system
7. When a cell's membrane potential changes from -70 mV to -90 mV, the cell is said to be:
 - A. depolarized
 - B. repolarized
 - C. hyperpolarized
 - D. at threshold

8. Cell bodies of neurons that relay sensory inputs to the spinal cord during a reflex reside in:
- A. the basal nuclei
 - B. the dorsal root ganglia
 - C. cerebral gray matter
 - D. sensory receptors, such as thermoreceptors and mechanoreceptors
9. A neuron that has one dendrite and one axon is structurally classified as a:
- A. multipolar neuron
 - B. tripolar neuron
 - C. bipolar neuron
 - D. unipolar neuron
10. Which of the following statements is TRUE regarding nerves?
- A. They are prominent structures in both the CNS and PNS.
 - B. They lack connective tissue sheaths.
 - C. They conduct impulses unidirectionally (in one direction only).
 - D. They contain bundles of axons in the PNS.
11. Which of the following cellular structures is a common component of the axon?
- A. ribosomes
 - B. synaptic vesicles
 - C. microtubules
 - D. endoplasmic reticulum
12. If a neuron is in the relative refractory period, which of the following is occurring?
- A. Na^+ is entering the cell.
 - B. Ca^+ is leaving the cell.
 - C. K^+ is entering the cell.
 - D. K^+ is leaving the cell.
13. If a neuron is in the absolute refractory period, which of the following is true?
- A. The cell cannot be stimulated again.
 - B. The cell is hyperpolarized.
 - C. The cell can only be stimulated by a significantly strong second stimulus.
 - D. Additional stimulations will result in tetanus.
14. Which of the following can be found in the cerebral white matter?
- A. cell bodies
 - B. dendrites
 - C. myelin
 - D. Schwann cells
15. The blood-brain barrier:
- A. is formed by tight junctions.
 - B. is formed by oligodendrocytes.
 - C. provides support to the brain tissue.
 - D. tightly regulates the intracellular environment of the CNS.

16. An excitatory postsynaptic potential would result in a cell's resting membrane potential:
- A. changing from -70 mV to -85 mV.
 - B. remaining at 0 mV.
 - C. changing from -70 mV to -60 mV.
 - D. becoming refractory to additional stimuli.
17. Which of the following statements is true about the brain's motor areas?
- A. They are responsible for both voluntary and involuntary movements.
 - B. They are found within the brain's white matter.
 - C. They do not communicate with the cerebellum.
 - D. They are found on the frontal lobe.
18. Which of the following lists is correctly arranged, from superficial to deep?
- A. epineurium, perineurium, endoneurium
 - B. endoneurium, epineurium, perineurium
 - C. perineurium, epineurium, ectoneurium
 - D. endoneurium, perineurium, epineurium
19. Which of the following is **NOT** a function of the myelin sheath?
- A. It protects the axon.
 - B. It assists in the transfer of O₂ and nutrients between blood and nervous tissues.
 - C. It serves as an important structure in salutatory conduction of action potentials.
 - D. It electrically insulates the axon.
20. Which of the following animal movements is an appropriate metaphor for describing saltatory conductions?
- A. an earthworm moving along the ground
 - B. a moth moving towards a light
 - C. a *Paramecium* beating cilia
 - D. a frog leaping between lily pads

True/False. Mark each of the following statements with a T (if true) or an F (if false) (4 pts each).

- _____ 21. The sound of a car backfiring results in action potentials of greater magnitude than the sound of a bird chirping.
- _____ 22. Cerebrospinal fluid helps the brain and spinal cord “float” in the dorsal body cavities.
- _____ 23. Both the brain and the spinal cord possess an outer cortex of gray matter.
- _____ 24. Stepping on a sharp nail stimulates baroreceptors.
- _____ 25. Schwann cells are functionally similar to satellite cells.
- _____ 26. Fascicles are bundles of axons wrapped in a sheath called the perineurium.
- _____ 27. Brain stem structures are important for voluntary activities, such as speech and writing.
- _____ 28. Images observed through the left eye are processed by the visual cortex of the right cerebral hemisphere.
- _____ 29. Nodes of Ranvier are commonly found on the dendrites of multipolar neurons.
- _____ 30. The dura mater consists of two layers around the brain, but only one around the spinal cord.

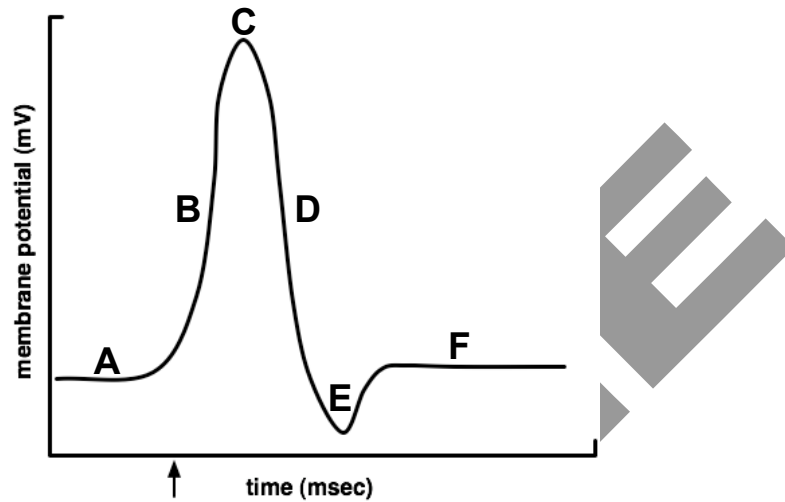
Matching. Match each of the regions of the cerebral cortex with the definition that best matches its understood function (4 pts each).

- | | |
|-----------------------------|---|
| _____ 31. cerebral cortex | A. largest region of diencephalon; routes sensory inputs to cerebral cortex |
| _____ 32. commissure | B. tract that serves as communication route within a particular hemisphere |
| _____ 33. projection fiber | C. controls homeostasis as center of the autonomic nervous system |
| _____ 34. association fiber | D. tract that unites the left and right cerebral hemispheres |
| _____ 35. basal nuclei | E. regulates sleep-wake cycles |
| _____ 36. thalamus | F. brain region responsible for motor, sensory and higher brain functions |
| _____ 37. hypothalamus | G. brain region that contains respiratory centers |
| _____ 38. pineal gland | H. gray matter region that controls complex motor outputs |
| _____ 39. cerebellum | I. tract that unites the cerebral cortex with lower CNS structures |
| _____ 40. pons | J. interacts with cerebral hemispheres to produce controlled motor outputs |

41. The ten steps below describe the events that occur during a reflex arc that is processed at the level of the spinal cord. Rank them in order of their execution by numbering them from 1 (occurring first) to 10 (occurring last). (2 pts each)

- _____ Impulse reaches cell bodies of dorsal root ganglion.
- _____ Impulse is transmitted to interneurons.
- _____ Impulse arrives at and stimulates effector organ.
- _____ Receptor is stimulated.
- _____ Impulse travels along ventral root.
- _____ Impulse is transmitted to cell bodies of motor fibers in anterior horn.
- _____ Impulse travels along sensory fibers of spinal nerve.
- _____ Impulse travels along motor fibers of spinal nerve.
- _____ Impulse enters posterior horn.
- _____ Impulse travels along dorsal root.

At a chemical synapse in the body, a presynaptic cell releases a neurotransmitter onto a postsynaptic cell (see arrow), and the postsynaptic cell's membrane potential is recorded. The results are shown below:



44. Using the letter labels on the graph, circle the **ONE** correct answer for each of the following statements (4 pts each):

- | | | | | | | |
|--|---------|---------|---------|---|---|---|
| a. Cell is in the relative refractory period. | [A-B-C] | [B-C-D] | [D-E-F] | | | |
| b. Na^+ channels close and K^+ channels open. | A | B | C | D | E | F |
| c. Na^+/K^+ pump is maintaining the cell's membrane potential. | A | B | C | D | E | F |
| d. Cell experiences an EPSP. | A | B | C | D | E | F |
| e. Cell is hyperpolarized. | A | B | C | D | E | F |
| f. Cell is in the absolute refractory period. | [A-B-C] | [B-C-D] | [D-E-F] | | | |
| g. Na^+ is entering the cell faster than K^+ is leaving. | [B-C-D] | [C-D-E] | [D-E-F] | | | |
| h. K^+ channels begin to close. | A | B | C | D | E | F |

45. Describe (in words) how the graph would appear if the postsynaptic cell experienced an IPSP (6 pts).
