

PSYCH 511 Exam

November 4, 2016

You may take up to 4 hours to complete this exam. You *may* use your book, notes, or other resources, but *not* another person. You may either print the exam and turn it in to me personally, or deposit it in my mailbox in Moore, or, you may send it to me electronically. Exams are due in class on November 14, 2015.

Name: _____

1 Multiple Choice

1. The myelin sheath is formed by _____ in the central nervous system and by _____ in the peripheral nervous system.
 - A. Oligodendrocytes; Schwann cells.
 - B. Schwann cell; Oligodendrocytes.
 - C. Astrocytes; Schwann Cells.
 - D. Stellate cells; Microglial cells.
2. At the *peak* of the action potential...
 - A. Both the forces of diffusion and electrostatic pressure tend to move K^+ out of the cell.
 - B. The force of diffusion tends to move Cl^- outside the cell.
 - C. Both the forces of diffusion and electrostatic pressure tend to move Na^+ outward.
 - D. The force of diffusion tends to move K^+ in; the force of electrostatic pressure moves K^+ out.
3. When a neuron is at rest, Cl^- concentration is highest outside the cell. Thus, when Cl^- channels open, Cl^- ions move _____ the cell, creating an _____ effect on the cell.
 - A. into; inhibitory
 - B. into; excitatory
 - C. out of; inhibitory
 - D. out of; inhibitory
4. If you wanted to know how the brain responds on a millisecond-to-millisecond basis to a stimulus but didn't care as much about where the activity was occurring, you should choose _____. If you needed to know what brain regions were active in response to a stimulus, but cared less about knowing the specific time course, you should choose _____.
 - A. EEG; Functional MRI (fMRI).
 - B. fMRI; PET
 - C. Structural MRI; MEG
 - D. NIRS; ERP
5. A toxin in pufferfish, a Japanese delicacy, blocks voltage-gated Na^+ channels. Why might this be bad for you?
 - A. It could turn IPSPs into EPSPs.
 - B. It would slow neurotransmitter movement across the synaptic cleft.
 - C. It would block action potentials.
 - D. It would prevent the undershoot phase of the action potential.
6. Which of the following statements about synaptic communication is CORRECT?
 - A. Ionotropic receptors contain only a neurotransmitter binding site, not an ion channel.
 - B. Most neurons contain gap junctions or direct electrical coupling sites with other neurons.
 - C. Metabotropic receptors are faster-acting than ionotropic receptors.
 - D. Metabotropic receptors activate ion channels separate from the receptor itself through chemical messengers called G-proteins.

7. Which of the following statements about human head/brain size are true?
- A. Our brains are bigger than our spinal cords.
 - B. Our heads at birth are bigger than they should be for safe passage down the birth canal.
 - C. Our skulls are too small to contain our cerebral cortex.
 - D. Our brains are bigger than other mammals of similar body size.
8. Depolarization of the presynaptic terminal leads to an influx of _____, which causes exocytosis or the fusion of _____ with the presynaptic membrane.
- A. Na^+ ; Ligands.
 - B. Ca^{2+} ; Synaptic vesicles.
 - C. Ca^{2+} ; Neurotransmitters.
 - D. Na^+ ; G-proteins.
9. The fiber bundle that connects the left and right hemisphere is called the _____, while the deep groove that divides frontal and temporal lobes is called the _____.
- A. corpus callosum; Sylvian (lateral) fissure
 - B. the Sylvian (lateral) fissure; the central sulcus
 - C. corpus callosum; the central sulcus
 - D. longitudinal fissure; corpus callosum

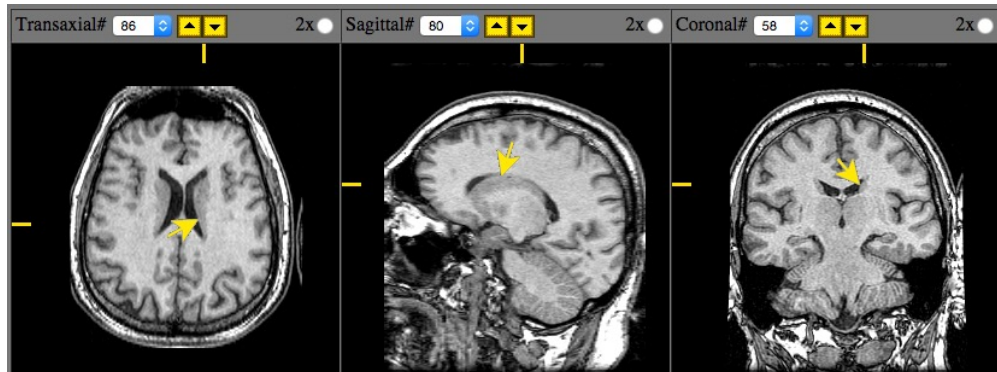
Please put in their proper order the steps that lead to synaptic communication between neurons using the choices below.

- A. Voltage-gated Ca^{++} channels open
 - B. Action potential propagates down presynaptic axon.
 - C. Ca^{++} initiates exocytosis of neurotransmitter
 - D. Ligand-gated receptors bind neurotransmitter and activate channels in the postsynaptic cell
 - E. Neurotransmitter diffuses across synaptic cleft
10. Step 1
11. Step 2
12. Step 3
13. Step 4
14. Step 5

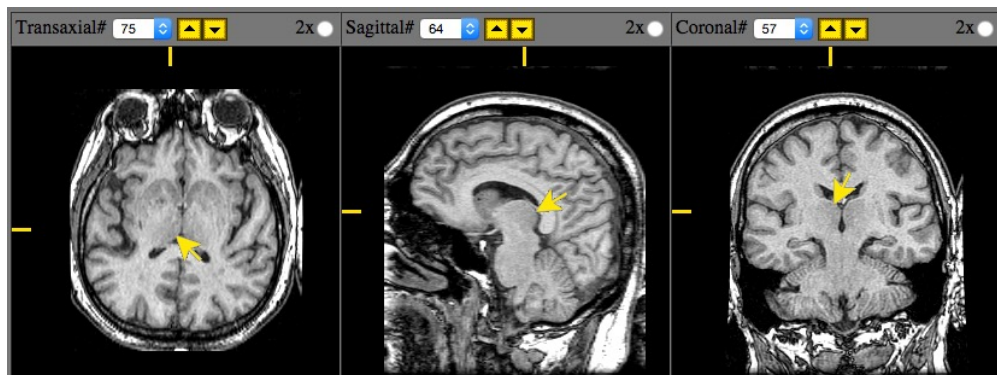
15. Parkinson's and Schizophrenia are both linked to a disturbance in one of the _____ pathways projecting from the _____ to the forebrain.
- A. dopamine; midbrain tegmentum
 - B. acetylcholine; midbrain tectum
 - C. serotonin; mesolimbocortex
 - D. dopamine; locus coeruleus
16. When an unknown drug is applied to the synapse between a nerve and skeletal muscle, activity in the muscle stops. Based on this, you conclude that the drug is an _____ and could operate by _____.
- A. agonist; blocking neurotransmitter release
 - B. antagonist; blocking reuptake mechanisms
 - C. agonist; blocking enzyme degeneration of transmitter
 - D. antagonist; blocking postsynaptic receptors
17. Segmental organizational schemes are characteristic of the nervous systems of which animal groups?
- A. vertebrates alone.
 - B. selected invertebrates alone – worms, arthropods.
 - C. vertebrates and selected invertebrates.
 - D. no animal group has a segmental organization to its nervous system.
18. fMRI _____ measures the activity of _____ neurons in a particular region of the brain by means of a magnetic signal associated with differences in _____ oxygen levels.
- A. indirectly; individual; CSF.
 - B. directly; individual; blood.
 - C. indirectly; large groups; blood
 - D. directly; large groups; BOLD.

2 Identification

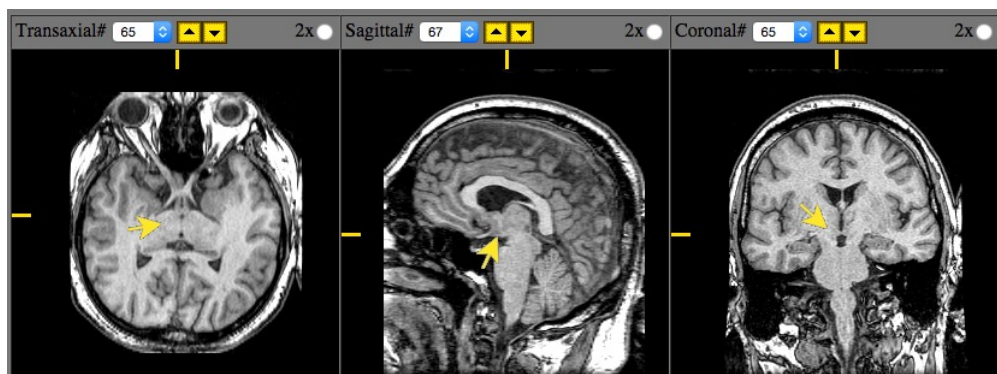
19. Identify the structure in the images below.



20. Identify the structure in the images below.



21. Identify the structure in the images below.



3 Short answer

Please answer *both of* the following questions in a few short paragraphs. You may create a small figure or two if it helps you. Please use complete sentences.

22. Describe the events that lead to and occur during an action potential.

23. Describe the principal components of the cerebral cortex and the external landmarks (fissures and sulci) that separate one part from the other.

5 Short answer

Please answer one (1) of the following questions in a few short paragraphs.

27. How does the action potential propagate down the axon in an unmyelinated neuron? How does the process differ in a myelinated axon?
28. What sorts of messages are received by the receiving or postsynaptic neuron? How are these messages generated? Describe an example of the postsynaptic effect a specific neurotransmitter might have.
29. Describe the two types of refractory periods neurons show. How does the fact that the action potential has an absolute refractory period and a stereotyped amplitude influence the kind of message a neuron can convey?

6 Short answer

Please answer one (1) of the following questions in a few short paragraphs.

30. Which three neurotransmitters are released at the majority of synapses in the nervous system? What are their basic functions?
31. What distinguishes a neuromodulator from other types of neurotransmitters? Give two examples of neuromodulators, brief descriptions of some of their known functions, and where in the brain these cells are clustered.
32. Explain how metabotropic receptors differ from ionotropic ones. Give an example of a neurotransmitter system that depends on both types.

9 Bonus

Answer one (1) additional short answer question from Sections 3-7.