

## 17. Histology of the Nervous System and Anatomy of the Spinal Cord

### Answers to questions

1. The bodies of somatic motor neurons are in the CNS. However, their axons extend into the periphery to synapse with skeletal muscles. Thus, the telodendria and axon terminals are with the skeletal muscles.
2. A synapse is a junction between two neurons or between a neuron and an effector.
3. The myelin sheath is made of glial cells.
4. The sensory neuron appears nearly spherical, with no obvious projections. The motor neuron is more angular in shape with obvious processes (dendrites and axon).
5. The bodies of the sensory neurons viewed in this activity are in the dorsal root ganglia. In general, sensory neurons are found in ganglia.
6. Afferent axons pass through the dorsal roots. Efferent axons pass through the ventral roots.
7. If ventral roots were cut, then effectors would receive no motor commands from the spinal cord (paralysis). If dorsal roots were cut, then the spinal cord would receive no sensory information (paresthesia).

## 18. Neurophysiology

### Answers to questions

1. The membrane voltage becomes more positive. In the neuron, this is generally a depolarization.
2. The simple answer is that the voltage-gated sodium channels close (this answer is perfectly fine). A very good student may also pick up on the fact that as the membrane potential approaches +30 mV the electrochemical gradient for sodium dissipates.
3. Potassium is diffusing out of the cell through voltage-gated potassium channels.
4. The electrochemical gradient “break even” point for potassium is approximately -90 mV. During an action potential, the channels for potassium stay open long enough for potassium to approach its break even point.
5. Synaptic vesicles are found in the axon terminals, and they contain neurotransmitters.
6. Exocytosis is the process by which neurotransmitters are released from the axon terminal into the synaptic cleft.
7. Yes, neurotransmitters bind to receptors on the postsynaptic cell and open chemical-gated channels. This causes a graded potential (either depolarizing or hyperpolarizing) to occur in the postsynaptic cell.
8. No. The release of neurotransmitters may be insufficient to cause the postsynaptic cell to reach threshold. Furthermore, some neurotransmitters hyperpolarize (inhibit) the postsynaptic cell.
9. Axon terminals and synaptic vesicles are parts of the presynaptic cell.
10. The receptors/ion channels are parts of the postsynaptic cell.

## 19. Reflexes and an Introduction to the Human Brain

### Answers to questions

1. Given one sensory neuron, one interneuron, and one motor neuron, there should be two synapses in the CNS. The reflex is polysynaptic.
2. A skeletal muscle.

3. monosynaptic, somatic, spinal, ipsilateral
4. yes
5. no
6. There should have been a stronger response (a more pronounced kick). This may or may not have actually been observed.
7. If inhibitory signals are removed, then there should be a stronger response.
8. polysynaptic, somatic, spinal, ipsilateral
9. polysynaptic, somatic, spinal, contralateral
10. no
11. polysynaptic, autonomic, cranial, ipsilateral
12. One example is salivating in response to the smell of food, another is contractions of smooth muscle of the esophagus during swallowing. There are many others.
13. cerebrum
14. dorsal or posterior
15. loss of motor coordination or problems with balance