

## CHAPTER EIGHTEEN

### Content Review

1. The four CNS regions that control the autonomic functions are the cerebrum, hypothalamus, brainstem, and spinal cord.
2. The sympathetic trunk ganglia (also called paravertebral ganglia) are immediately lateral to the vertebral column (on both sides). They appear as numerous individual spheres connected to their neighbors by bundles of axons (like pearls on a string). The prevertebral ganglia (also called the collateral ganglia) are clusters of sympathetic division neuron cell bodies of ganglionic neurons located anterior to the vertebral column on the anterolateral wall of the abdominal aorta at the base of major abdominal arteries. The terminal ganglia are a collection of parasympathetic division neuron cell bodies of ganglionic neurons located very close to the target organ.
3. The postganglionic axon of the parasympathetic division is short and unmyelinated, and it releases acetylcholine. The postganglionic axon of the sympathetic division is long and unmyelinated; a few release acetylcholine, whereas most release norepinephrine.
4. When preganglionic axons synapse on cells within the adrenal medulla, the adrenal medulla cells release hormones that are circulated within the bloodstream and help prolong the fight- or-flight response. The cells of the adrenal medulla primarily secrete epinephrine and, to a lesser degree, norepinephrine. Once secreted into the bloodstream, these hormones potentiate (prolong) the effects of the sympathetic stimulation.
5. Axons exit the sympathetic trunk ganglia by one of four pathways: the spinal nerve pathway, the postganglionic sympathetic pathway, the splanchnic nerve pathway, and the adrenal medulla pathway.
6. In the sympathetic division of the ANS, the cell bodies of the preganglionic neurons are located in the lateral horns of the T1–L2 region of the spinal cord. The cell bodies of the ganglionic neurons are located within the sympathetic chain ganglia (paravertebral ganglia) or the prevertebral ganglia (collateral ganglia). The exception are the cells of the adrenal medulla that receive this preganglionic stimulation. In the parasympathetic divisions of the ANS, the cell bodies of the preganglionic neurons are located in the brainstem and lateral gray regions of the S2–S4 region of the spinal cord.
7. White rami communicantes carry myelinated preganglionic sympathetic axons from the T1–L2 spinal nerves to the sympathetic trunk. Through these rami, preganglionic sympathetic axons can enter the sympathetic trunk. Gray rami communicantes carry postganglionic sympathetic axons from the sympathetic trunk to the spinal nerve. Gray rami connect to *all* spinal nerves, including the cervical, sacral, and coccygeal spinal nerves. In this way, the sympathetic information that started out in the thoracolumbar region can be dispersed to all parts of the body.
8. The general functions of the sympathetic division are concerned with preparing the body for emergencies (increased blood pressure and rate of heartbeat, increased release of stored nutrients, increased respiration rate, dilation of pupils), whereas the parasympathetic division is primarily involved with conserving energy and

replenishing energy stores.

9. In a crisis, many effectors innervated by the sympathetic division respond together, a process called mass activation. Preganglionic sympathetic axons form numerous collateral branches in order to synapse with a large number of ganglionic neurons to cause stimulation of many ganglionic sympathetic neurons and simultaneous activation of many effector organs. Mass activation of the sympathetic division causes a heightened sense of alertness as a consequence of the stimulation of the reticular activating system.
10. Autonomic reflexes are comparable to spinal reflexes because they involve a sensory receptor, sensory neurons, interneurons in the CNS, motor neurons, and effector cells.