

## Amerman Active-Learning Workbook: Chapter 14 Answers

**Key Concept:** What are the steps of a visceral reflex arc?

Sensory signals from the viscera and skin are sent by sensory neurons to the brain or spinal cord. The stimuli are integrated by the CNS. Motor impulses from the CNS are sent via sensory neurons in cranial and spinal nerves to autonomic ganglia. The autonomic ganglia send the impulses via other efferent neurons to target organs where they trigger a motor response.

**Key Concept:** What is a key difference between autonomic and somatic neurons?

Unlike somatic motor neurons that largely go to skeletal muscle, autonomic motor neurons innervate smooth muscle cells, cardiac muscle cells, and glands to produce involuntary actions. Also, the autonomic neurons initially stimulated do not directly innervate their target cells. Two sequential neurons are in the pathway that leads to the target cell.

**Key Concept:** Why is the sympathetic nervous system also known as the “thoracolumbar division”? Why is the parasympathetic nervous system also called the “craniosacral division”?

Sympathetic cell bodies of the preganglionic neurons originate in the thoracic and upper lumbar spinal cord. Parasympathetic cell bodies of the preganglionic neurons are located within the nuclei of several cranial nerves in the brainstem and in the sacral region of the spinal cord.

**Key Concept:** How do the axons of splanchnic nerves differ from those of most other preganglionic sympathetic neurons?

The preganglionic axons of the splanchnic nerves synapse in collateral ganglia (celiac ganglion, the superior mesenteric ganglion, and the inferior mesenteric ganglion) that are located near the organs of the abdominopelvic cavity.

**Key Concept:** How do cholinergic and adrenergic receptors differ? Where do we generally find each type of receptor in the sympathetic nervous system?

Cholinergic receptors bind to ACh and are found in sweat glands, neurons within sympathetic ganglia and the adrenal medulla. Adrenergic receptors are receptors that bind to norepinephrine or epinephrine, and are generally found in diverse places such as the kidneys, the liver, the skin, cardiac muscle, and smooth muscle cells (including those in blood vessels and bronchioles).

**Key Concept:** How is the alpha-2 receptor different from other adrenergic receptors? What happens when norepinephrine binds these receptors?

Alpha-2 receptors are different from the other adrenergic receptors as most are found in the membrane of the preganglionic sympathetic neuron rather than in a peripheral target cell. When norepinephrine binds to these receptors, there is inhibition of the action potential such that the sympathetic response is dampened or shut off (preventing excessive sympathetic activity).

**Key Concept:** Which cranial nerves carry parasympathetic axons? What are the pelvic splanchnic nerves?

Parasympathetic axons are carried by the oculomotor, facial, glossopharyngeal, and vagus cranial nerves. The pelvic splanchnic nerves are branches from the sacral spinal cord and serve part of the large intestine, the urinary bladder, and the reproductive organs.

**Key Concept:** Which neurotransmitter is used by all parasympathetic neurons? To which types of receptors does this neurotransmitter bind?

Acetylcholine is the neurotransmitter is used by all parasympathetic neurons. ACh binds to nicotinic receptors in postganglionic parasympathetic neurons, and binds to muscarinic receptors in the membranes of all parasympathetic target cells.

**Key Concept:** How do the two divisions of the autonomic nervous system interact?

The sympathetic and parasympathetic nervous systems generally work antagonistically, and have the opposite effect on a particular body function or organ, thereby helping to maintain homeostasis.