

BIO 4432 – Human Anatomy*Resource #6*

The concepts this resource covers are the topics typically covered during this week of the semester. If you do not see the topics your particular section of class is learning this week, please take a look at other weekly resources listed on our website for additional topics throughout the semester.

We also invite you to look at the group tutoring chart on our website to see if this course has a group tutoring session offered this semester.

If you have any questions about these study guides, group tutoring sessions, private 30 minute tutoring appointments, the Baylor Tutoring YouTube channel or any tutoring services we offer, please visit our website www.baylor.edu/tutoring or call our drop in center during open business hours. M-Th 9am-8pm on class days 254-710-4135.

Keywords: Autonomic nervous system, Sympathetics, Parasympathetics, Effects on vessels and the heart

Topic of the Week: Autonomic Nervous System

The **autonomic nervous** system is a 2-neuron system.

- Pre-ganglionic neurons: transfer neurotransmitters
- Post-ganglionic neurons: go to effector organ

The autonomic nervous system controls **involuntary actions** and innervates **visceral organs**.

- Afferent and efferent innervation

Sympathetic and parasympathetic divisions:

Parasympathetics: CN III, CN VII, CN IX, and CN X

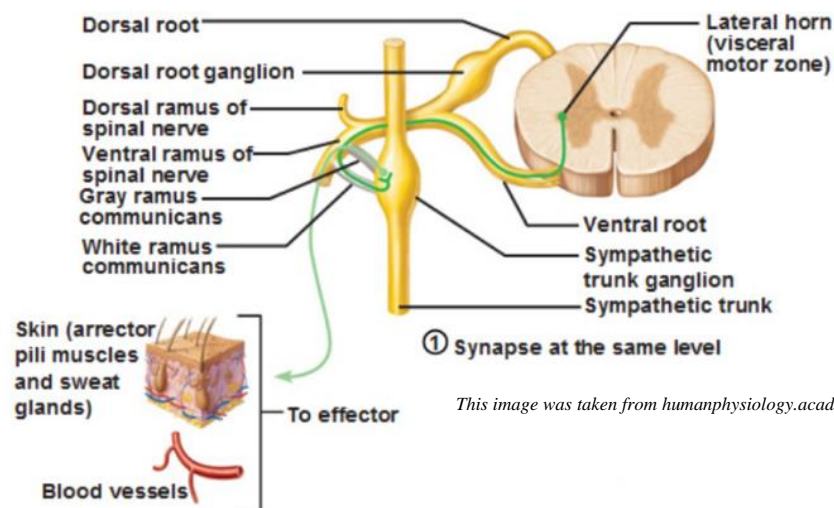
- Synapse **near or within the target organ**

Sympathetics: originate from the lateral horn of the spinal cord T1-L2

- Synapse at **sympathetic/collateral ganglia**
 - o The sympathetic ganglia contain cell bodies of post-ganglionic sympathetic nerves

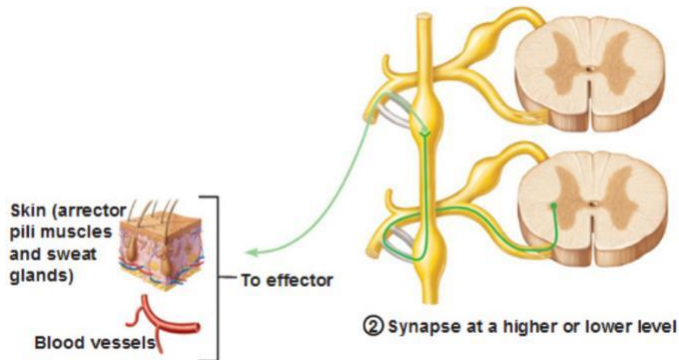
Highlight #1: Pathways of Sympathetic Neurons

Pathway #1: pre-ganglionic neuron synapses at a ganglion at the same level



This image was taken from humanphysiology.academy.

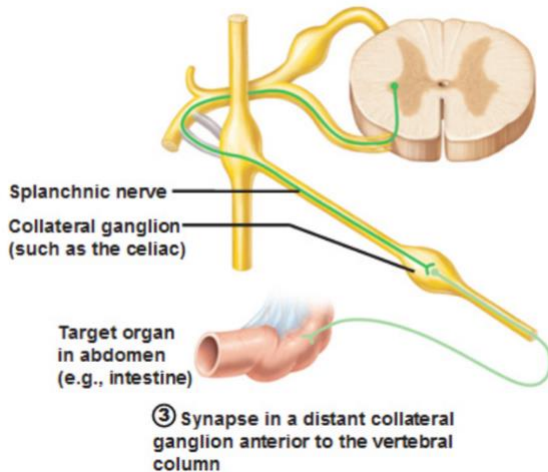
Pathway #2: pre-ganglionic neuron synapses at a ganglion at a level higher or lower



This image was taken from humanphysiology.academy.

Pathway #3: pre-ganglionic neuron passes through the sympathetic chain **without synapsing** to synapse in a collateral ganglion (near the unpaired branches of the abdominal aorta; these will be covered in more detail later in the course)

- These nerves are called **splanchnic nerves** and travel to abdominal organs!



This image was taken from humanphysiology.academy.

A few key terms:

White communicating ramus: takes pre-ganglionic sympathetics from the **spinal nerve into the sympathetic ganglion**

Gray communicating ramus: takes post-ganglionic from the **sympathetic ganglion out through the ventral ramus**

- Pathway #3 does not involve the gray communicating ramus

Highlight #2: Parasympathetics

The **parasympathetic** nervous system has the following functions:

- GI motility
- Innervates pelvic organs
- Constricts the pupils (CN III)
- Slows down heart rate

- Lacrimation (CN VII)
- Salivation (CN VII and IX)
- Dilates vessels

CN III, VII, IX, and X will be covered in more detail soon!

*Parasympathetics have NO EFFECT on sweat glands, arrector pili muscles (goose bumps), or peripheral blood vessels!

Highlight #3: Autonomic Effects on Vessels and the Heart

Sympathetics:

Vessels → vasoconstriction of peripheral vessels and vasodilation in skeletal muscle tissues
Heart → increase cardiac output, contractility, and heart rate

Parasympathetics:

Vessels → no effect on peripheral vessels
Heart → decrease cardiac output, contractility, and heart rate

*As a rule of thumb, think of the sympathetic division as “fight or flight” and the parasympathetic division as “rest and digest”!

Week 9 Knowledge Checkpoint:

1. Where do the pre-ganglionic sympathetic neurons synapse?
2. If a sympathetic neuron is traveling to the head, where will its pre-ganglionic neuron most likely synapse?
 - A. At the sympathetic ganglion at same level
 - B. At the sympathetic ganglion higher
 - C. At the sympathetic ganglion lower
 - D. Within the target organ
3. Describe the general pathway of a sympathetic neuron that will synapse at a ganglion at the same level.
4. Which of the following cranial nerves has parasympathetic functions?
 - A. CN II
 - B. CN VI
 - C. CN X
 - D. CN III

THINGS YOU MAY STRUGGLE WITH!

1. ***The pathways of sympathetic neurons:*** If it helps, draw it out! Make sure you know that sympathetic neurons traveling to the abdominal organs are called splanchnic nerves and DO NOT synapse in the chain

CONGRATS: You made it to the end of the resource! Thanks for checking out these weekly resources! Don't forget to check out our website for group tutoring times, video tutorials and lots of other resources: www.baylor.edu/tutoring!

Answers

1. In the sympathetic chain – UNLESS they are traveling to abdominal organs!
2. B
3. Lateral horn gray matter → ventral root → spinal nerve → white communicating ramus → synapse with post-ganglionic in the chain → gray communicating ramus → ventral ramus
4. C and D