



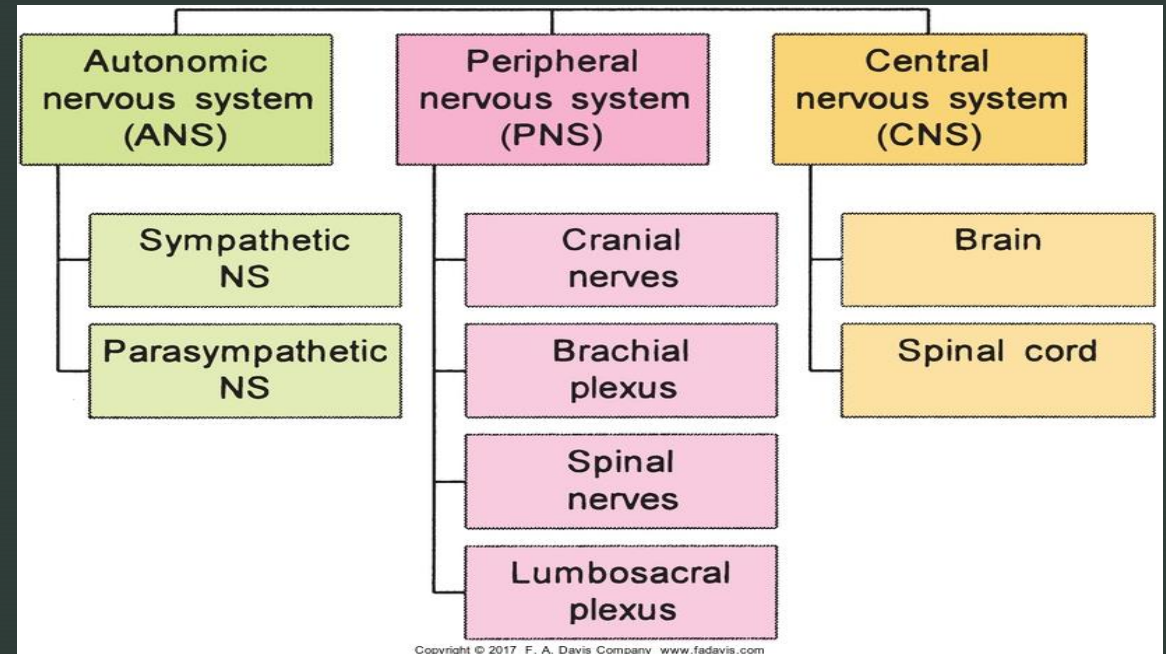
Nervous System I

PTA1010



Parts of the Nervous System:

- CNS- brain and spinal cord
- PNS- nerves outside the spinal cord and autonomic nervous system
- ANS- sympathetic/parasympathetic (involuntary)



- <https://www.khanacademy.org/science/health-and-medicine/human-anatomy-and-physiology/nervous-system-introduction/v/structure-of-the-nervous-system>

Functions of Nervous System

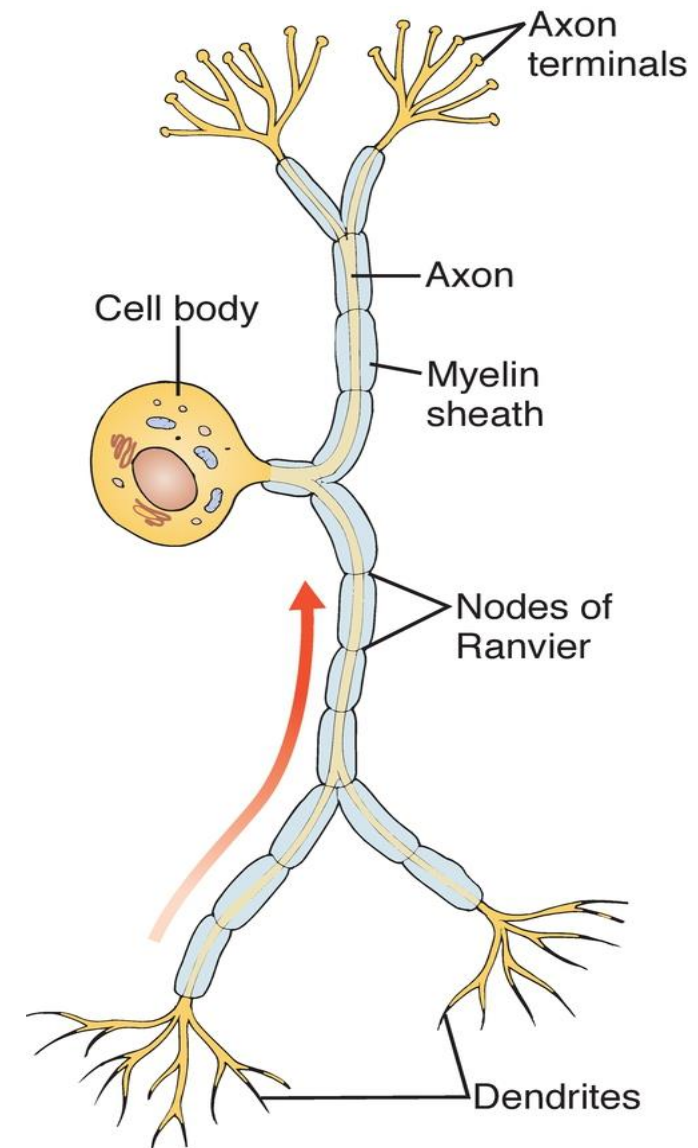
- **Sensory** – gathers info from outside/inside body
- **Transmission**- information to processing areas
- **Integration**- processes information in brain or spinal cord
- **Motor**- info to glands, muscles, organs to respond

Types of Neurons: Components

- **Sensory Neuron: A**fferent (TOWARD CNS)
- Receptor: mechano, thermo, chemo, photoreceptors in skin, muscles joints
- Interneuron: one or more sensory-motor synapses: most in spine
- **Motor Neuron: E**fferent (AWAY from CNS)
- Effector: muscle fibers or glands respond

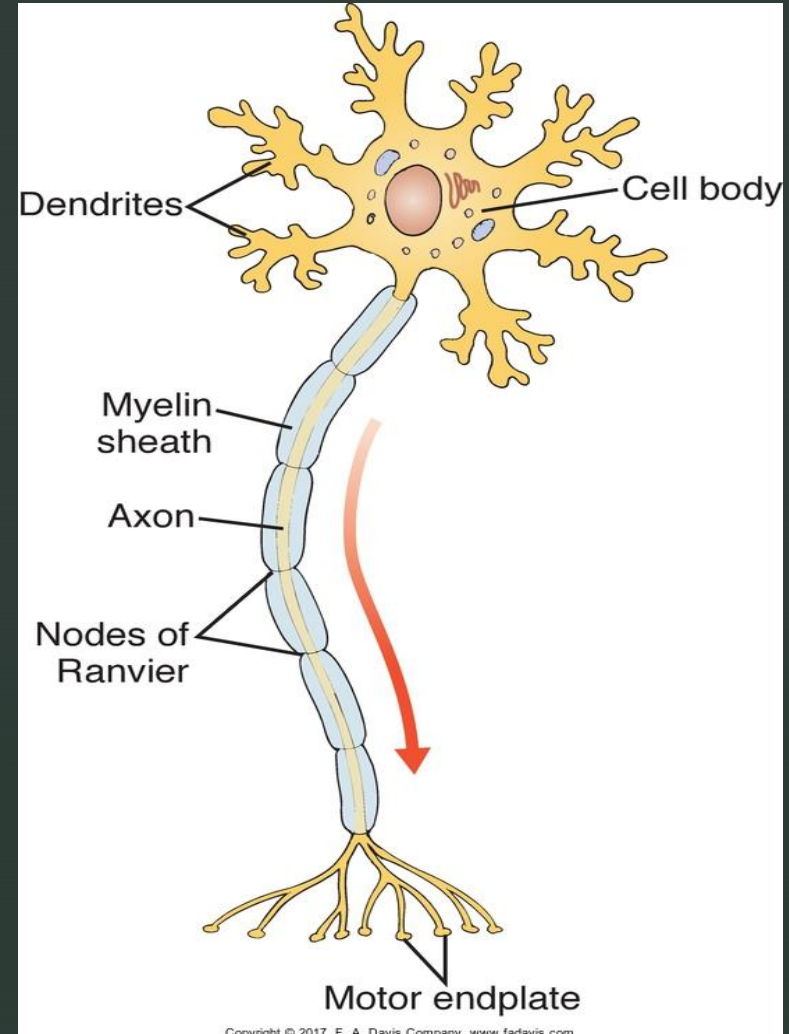
Parts of a Sensory Neuron:

- **Dendrites:** receive stimulus and **carry to** the cell body
- **Axon:** fiber which carries impulses **AWAY** from the cell body
- **Myelin:** dense lipid layer insulates axon, produced by Schwann cells
- **Axon Terminals:** release pre-synaptic neurotransmitters
- **Synapse:** gap between the axon of one neuron and dendrites of another, one way transmission
- **Neurotransmitter:** chemicals in the junction which allows impulses to be started in the second neuron
- Cell body in posterior/dorsal root ganglion



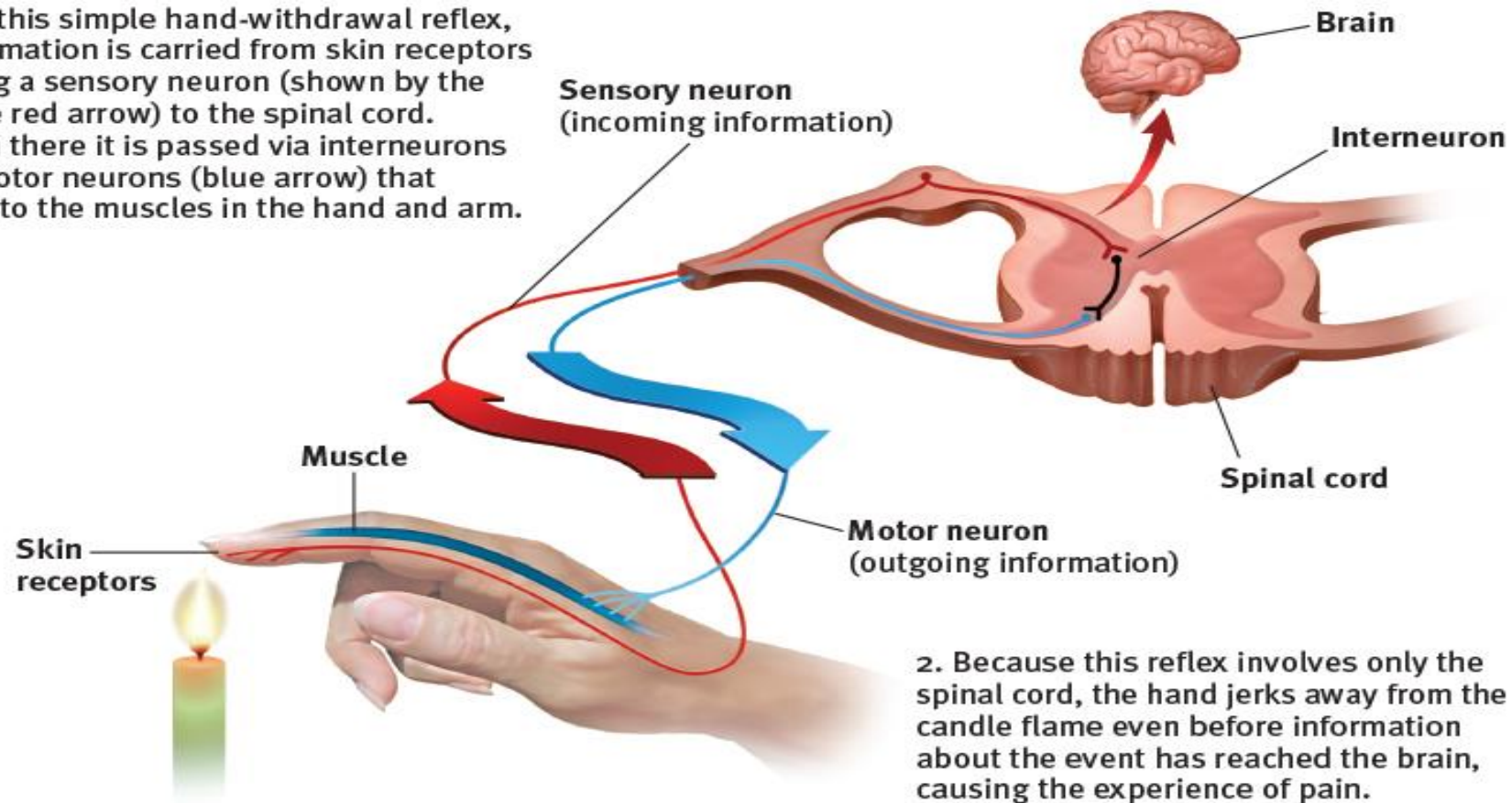
Nervous Tissue: Motor Neuron

- Basic functional unit of the nervous system
- Transmits impulses (up to 250 mph)
- **Stimulus** is a change in the environment sufficient to elicit a response: excitability of the neuron, convert the stimulus to a nerve **impulse**
- **ALL or Nothing:** same strength, self propagation
- Cell body in brain, spinal cord or anterior horn



Pain simple reflex

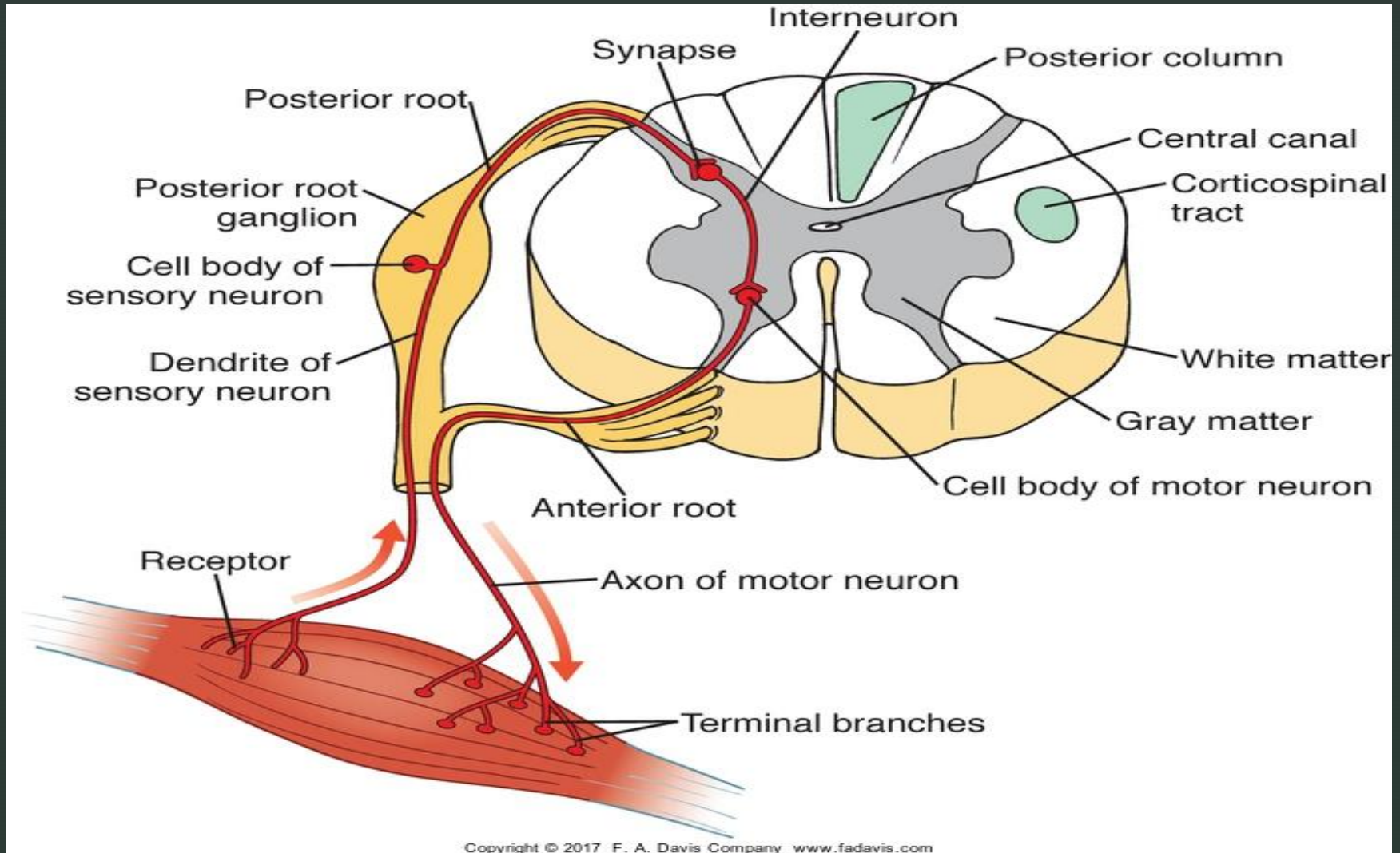
1. In this simple hand-withdrawal reflex, information is carried from skin receptors along a sensory neuron (shown by the large red arrow) to the spinal cord. From there it is passed via interneurons to motor neurons (blue arrow) that lead to the muscles in the hand and arm.



2. Because this reflex involves only the spinal cord, the hand jerks away from the candle flame even before information about the event has reached the brain, causing the experience of pain.

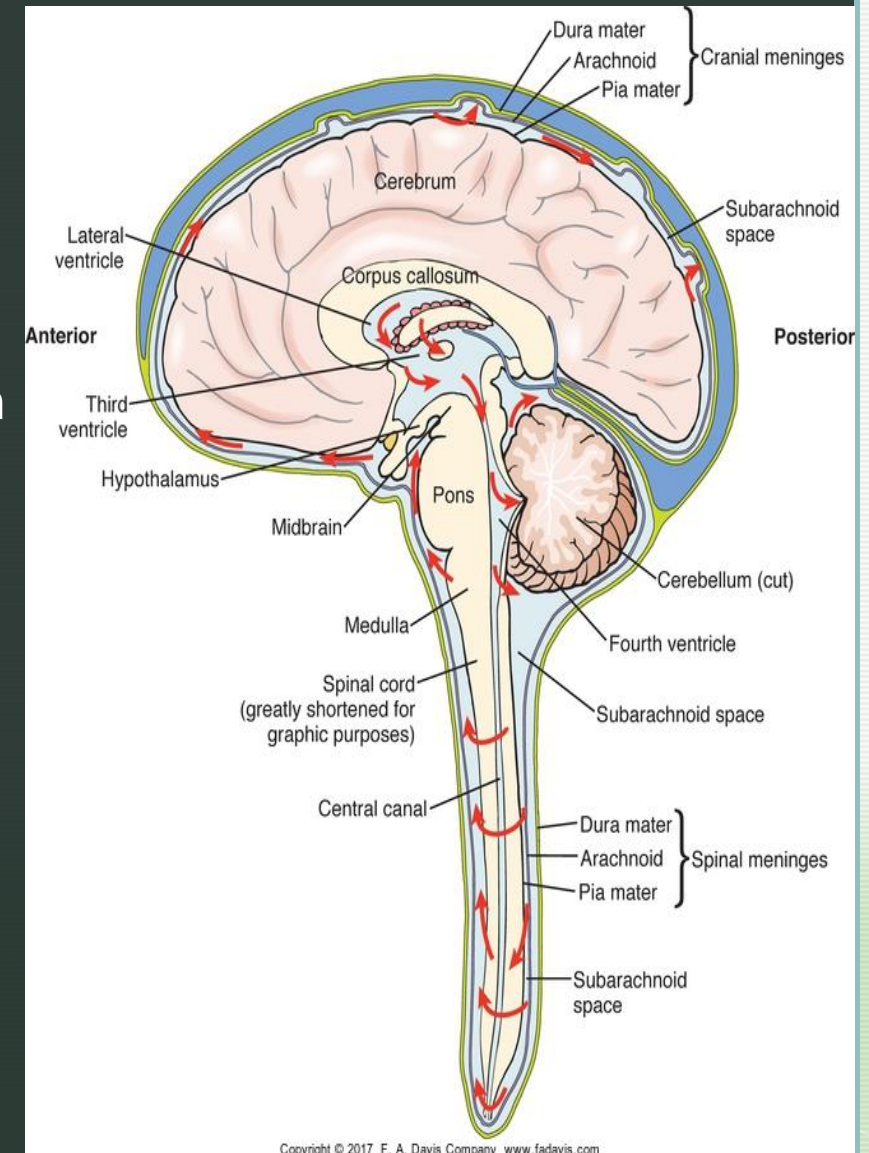
Figure 2.7

Myers/DeWall, *Psychology in Everyday Life*, 4e, © 2017 Worth Publishers



Brain Protection: 3 types

- Bony: skull
- Membranous: meninges for support and protection
Dura mater, Arachnoid, Pia mater
- Fluid: cerebrospinal fluid in the arachnoid space:
(between arachnoid and pia mater)

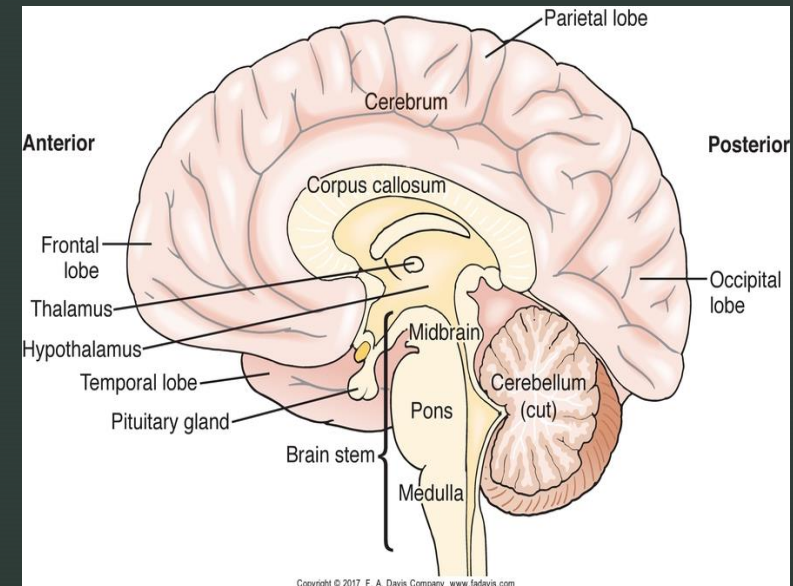


CNS: Brain and Spinal Cord

- **Cerebrum:** largest portion R and L hemispheres- corpus callosum

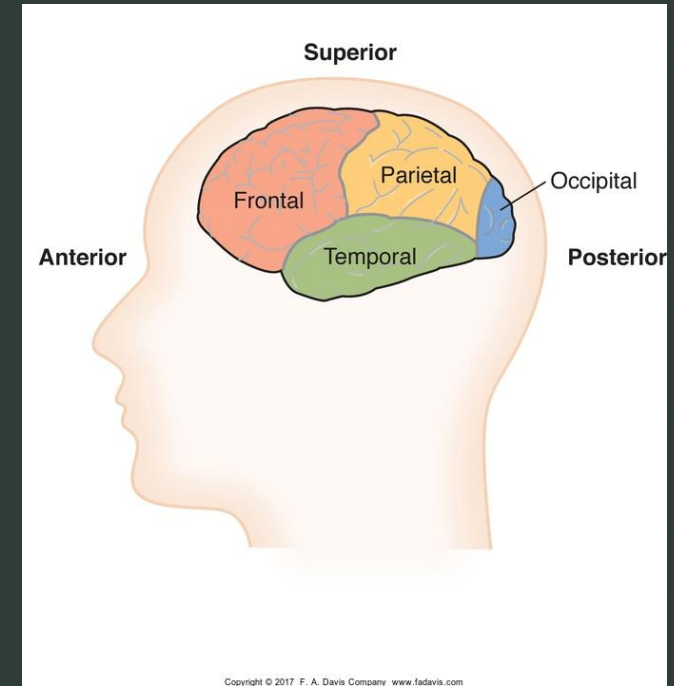
4 lobes: frontal, occipital, parietal, temporal

- **Cerebellum:** muscle coordination, tone and posture
- **Diencephalon:** thalamus and hypothalamus: relay center (PAIN)
- **Brainstem:** medulla, pons, midbrain



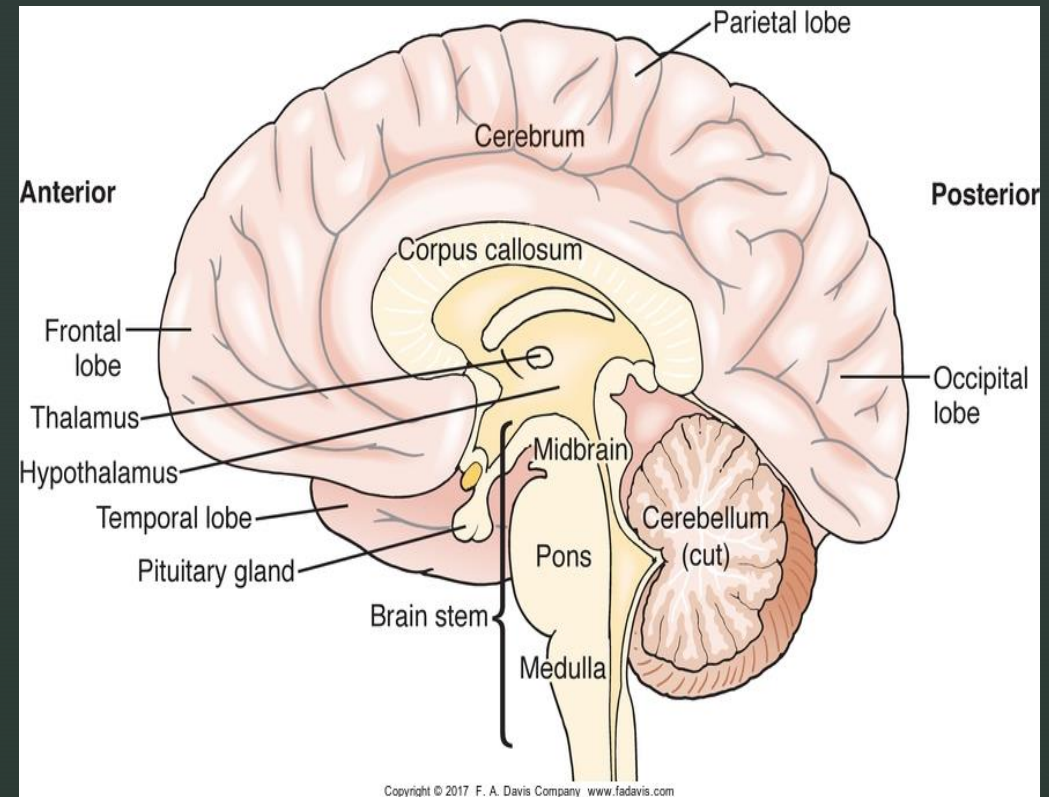
Cerebrum

- Right and Left hemispheres
- Corpus callosum connects
- Each hemisphere has
 - Layers of cells that are convoluted forming gyri and sulci
 - **Four lobes:**
 - Frontal: movement, expressive speech, personality
 - Parietal: sensory
 - Occipital: vision
 - Temporal: behavior, hearing, and language reception



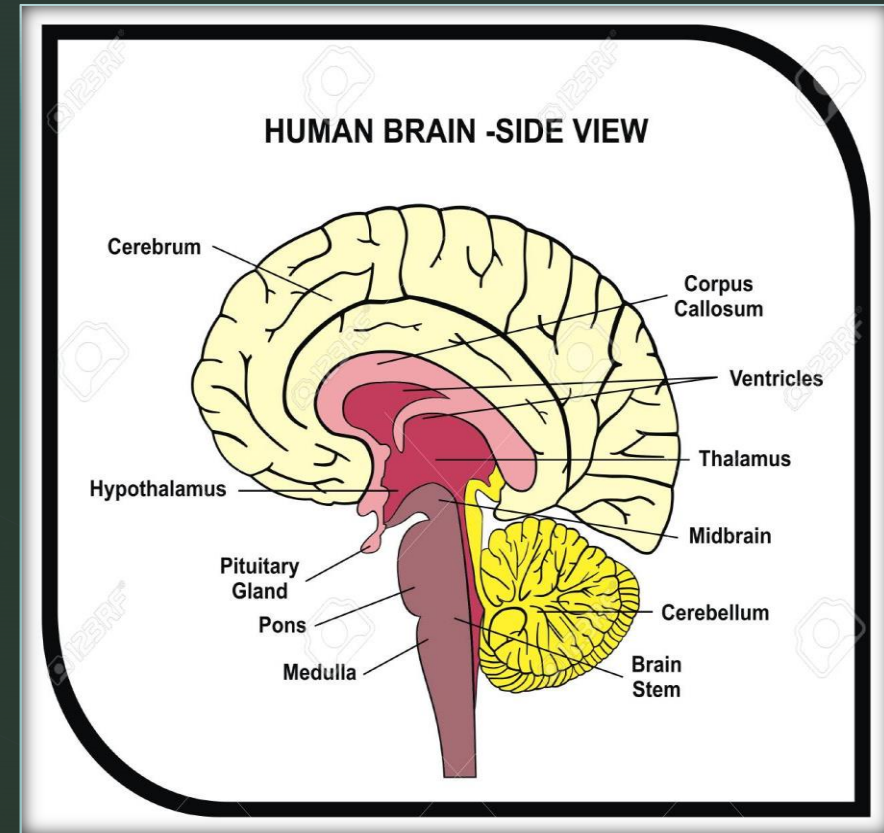
Deep Structures

- Thalamus:
 - Relay station for sensation
 - Pain perception
- Hypothalamus:
 - Hormonal regulation
 - Behavior
- Basal ganglia:
 - Coordination of movement



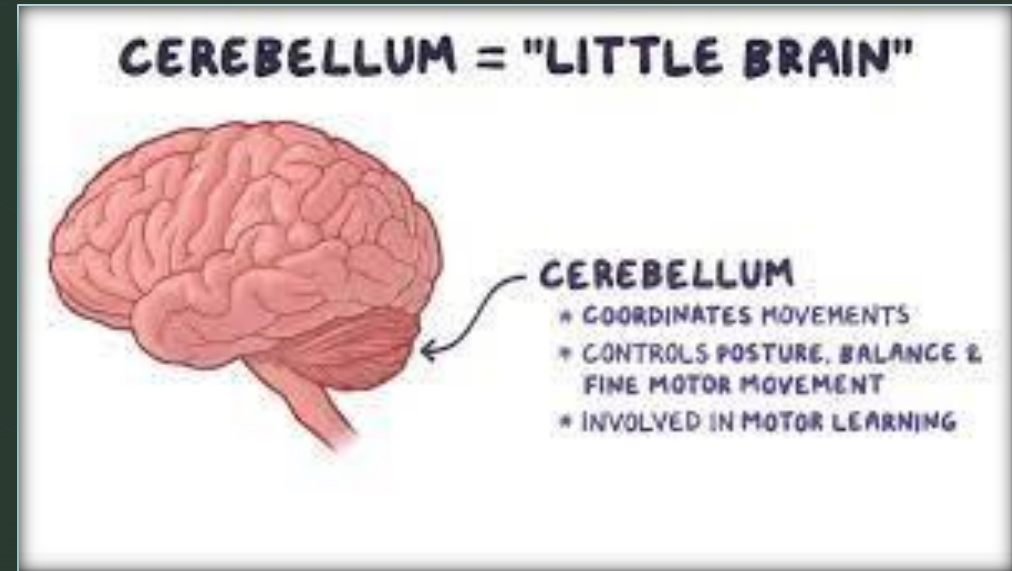
Brainstem

- Three parts: (superior to inferior)
 - **Midbrain:** visual reflexes
 - **Pons:** transverse nerve fibers connecting various nuclei to cerebellum
 - **Medulla oblongata:** regulation of respiration, blood pressure, heart rate



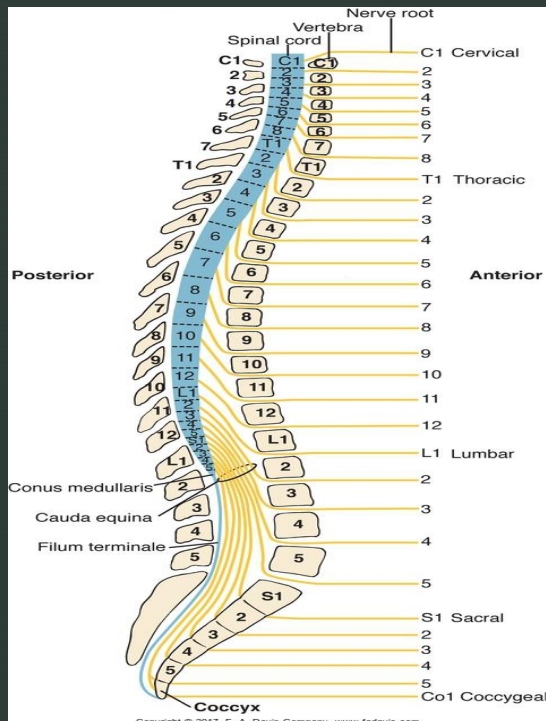
Cerebellum- (little brain)

- Behind pons and medulla
- Controls muscle tone, coordination, and posture



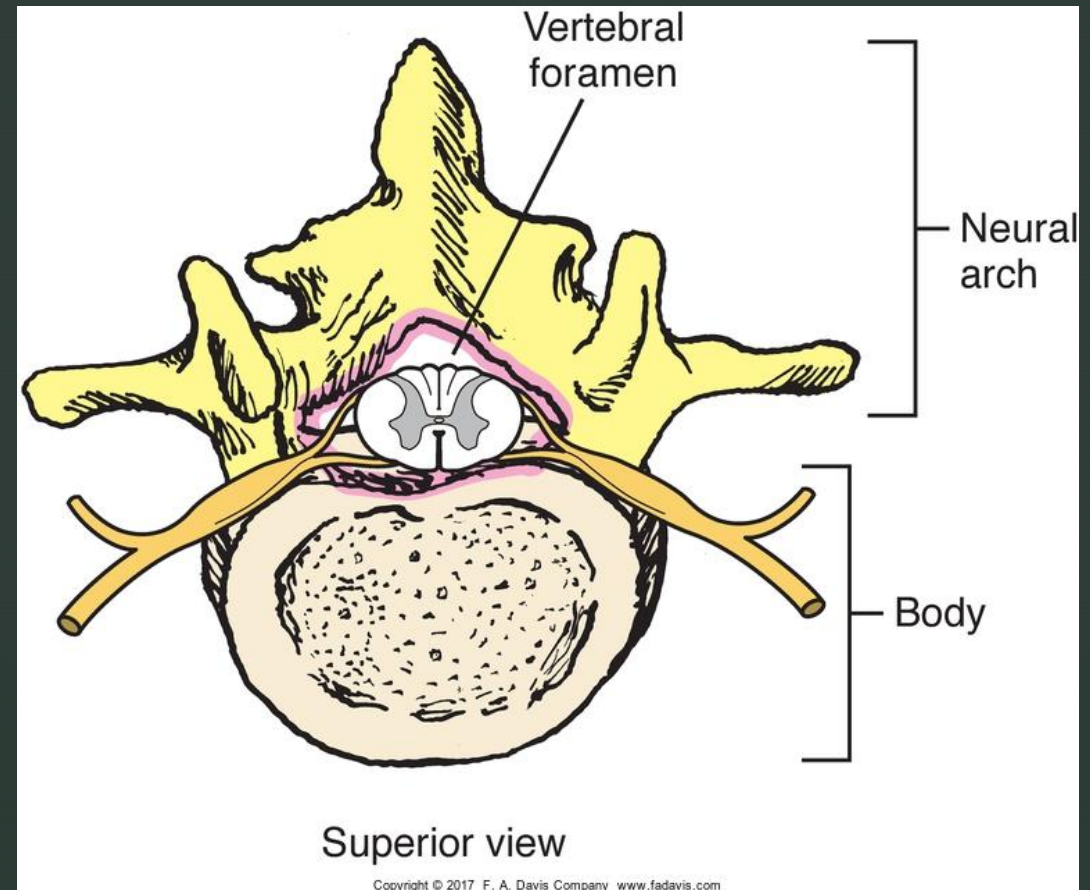
Spinal Cord: transmits information from brain to the rest of the body

- Runs from the Medulla to the conus medullaris **L2**
- Cauda equina- (horse's tail)- lower spinal nerves
- Filum terminale- end of the pia mater: gives longitudinal support

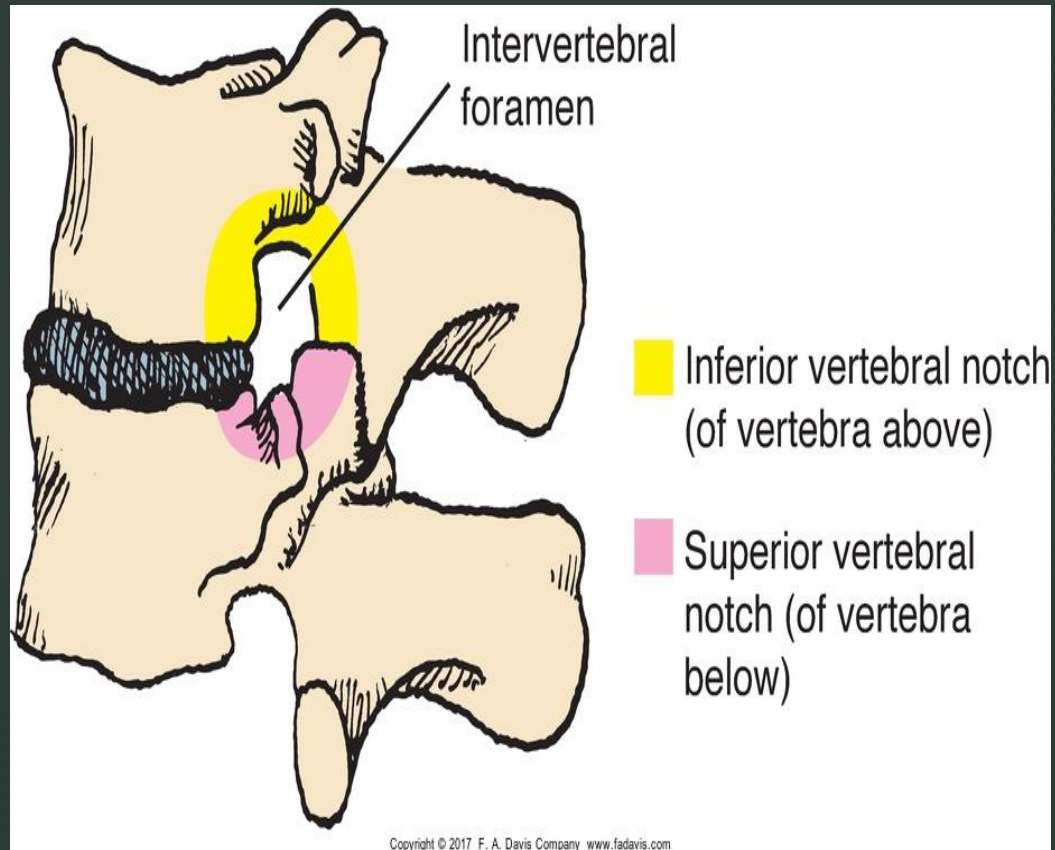


Vertebra:

- Spinal cord through vertebral foramen
- Vertebral body
- Neural arch
- Intervertebral foramen



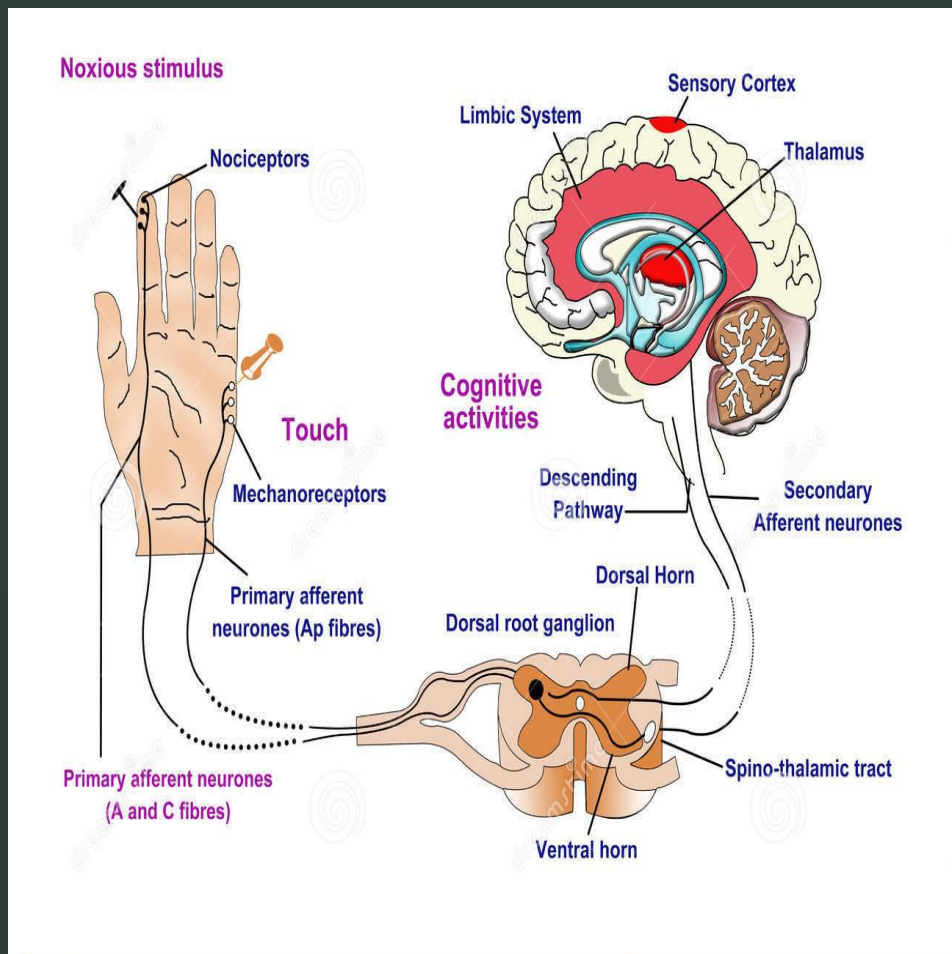
Vertebrae:



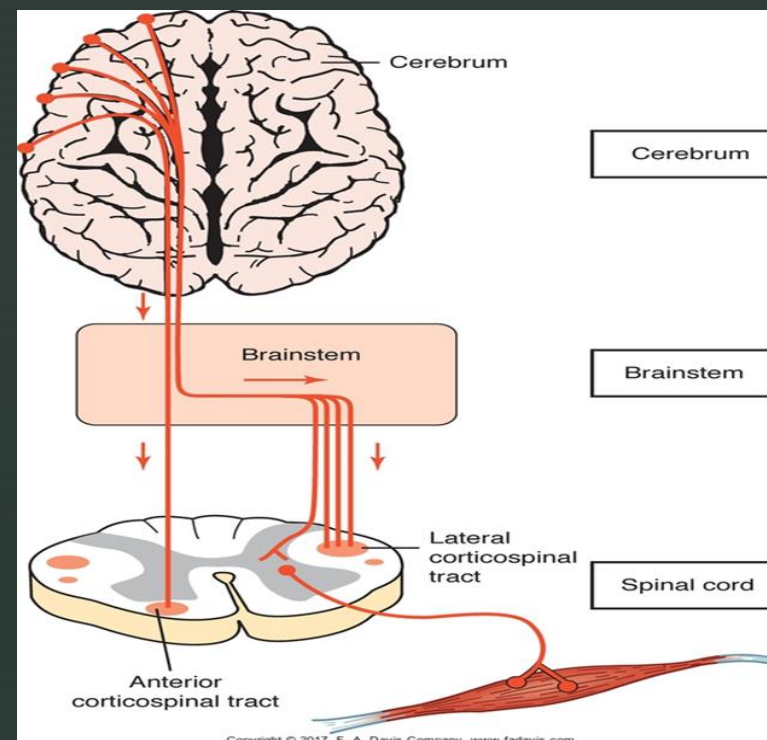
- Intervertebral foramen: formed by the
- Superior vertebral and inferior vertebral notches.
- synovial facet joints allow articulation and motion.

Spinal Cord Pathways:

► Ascending Sensory: Spinothalamic tract



Descending Motor: corticospinal tract

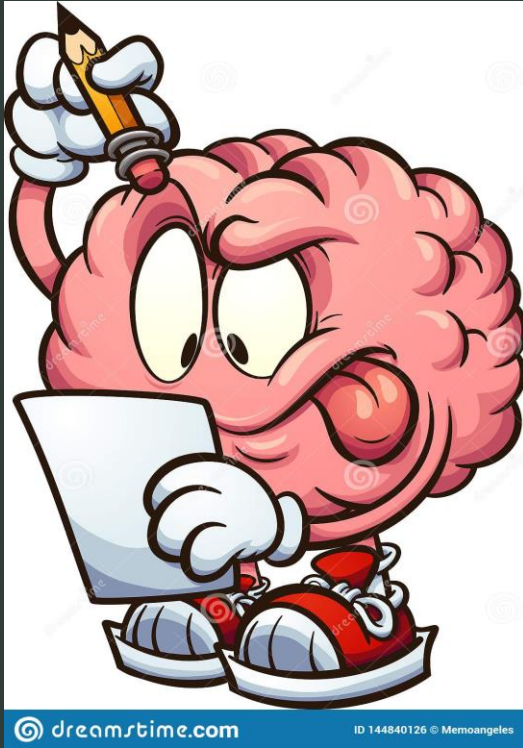


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Summary of the Nervous System

- <https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-biology-science/v/crash-course-biology-125>