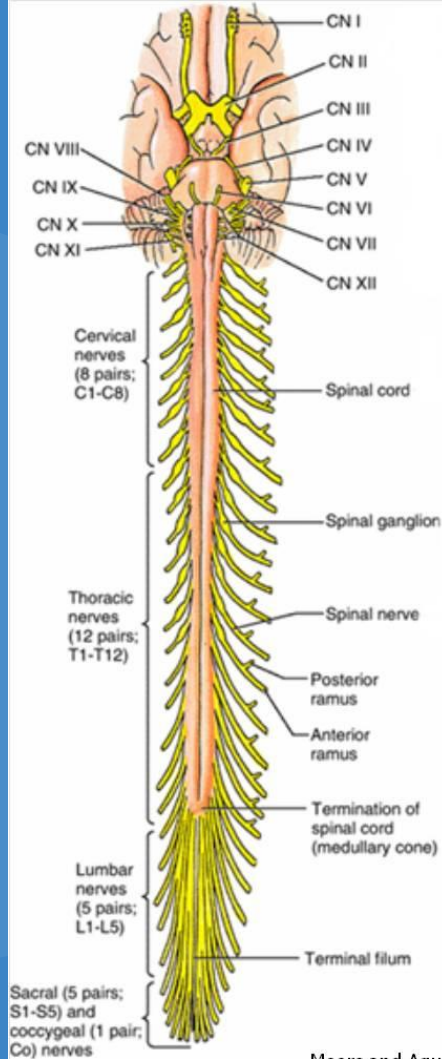


The Nervous System

The Spinal Cord

Spinal Cord

- Connects to brain to form the CNS
- ~18 in long
- Not the entire length of the vertebral column
 - Ends between L1 & L2
- Large amounts of gray matter in segments related to sensory & motor control
 - known as Enlargements

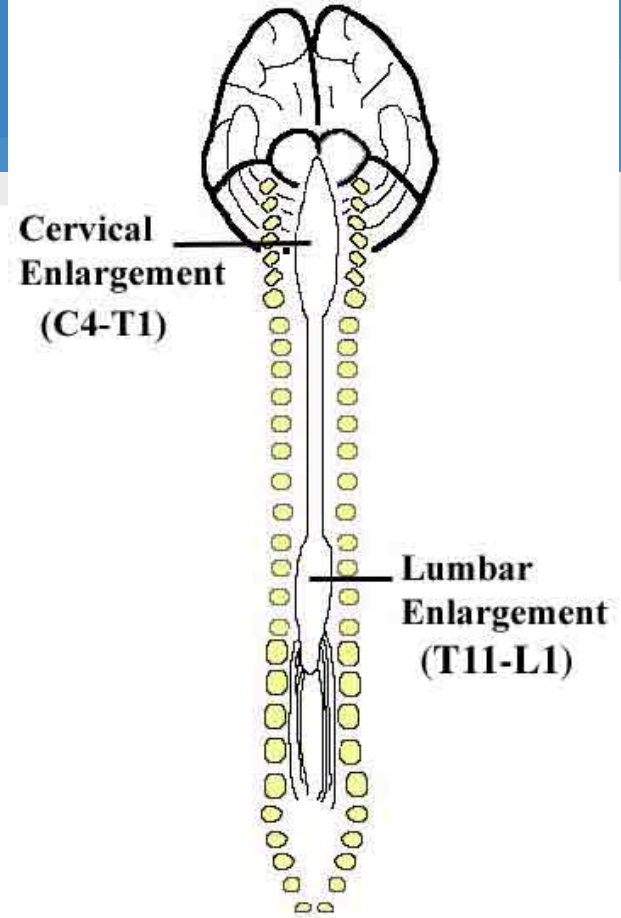


Meninges

- Continuous with cranial meninges
 - Dura Mater
 - Arachnoid Mater
 - Pia Mater
- Provide stability and shock absorption for the spinal cord
- Blood vessel branch through the meninges to deliver oxygen and other nutrients to the spinal cord
- Meningitis
 - inflammation of the meningeal membranes

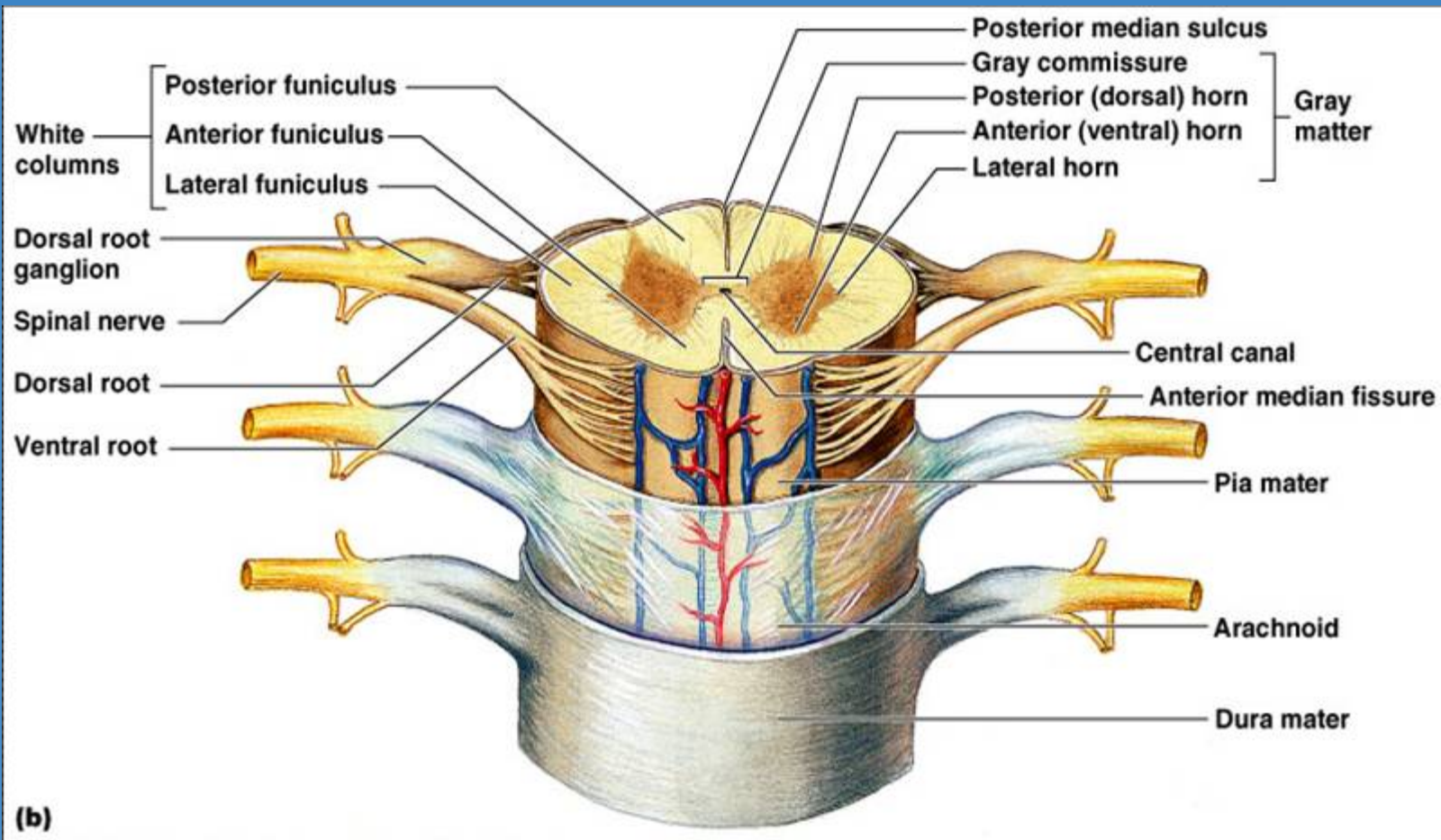
Enlargements

- **Cervical Enlargement**
 - nerves to shoulders and arms
- **Lumbar Enlargement**
 - nerves to pelvis and lower limbs



Structure

- Posterior Median Sulcus
 - shallow groove on the posterior of the spinal cord
- Anterior Median Fissure
 - deep groove on the anterior of the spinal cord
- Dorsal Root Ganglia
 - cell bodies of sensory neurons
- Dorsal Roots
 - axons of neurons that transmit sensory info to the spinal cord
- Ventral Roots
 - axons of neurons that transmit motor info to the periphery



Spinal Nerves

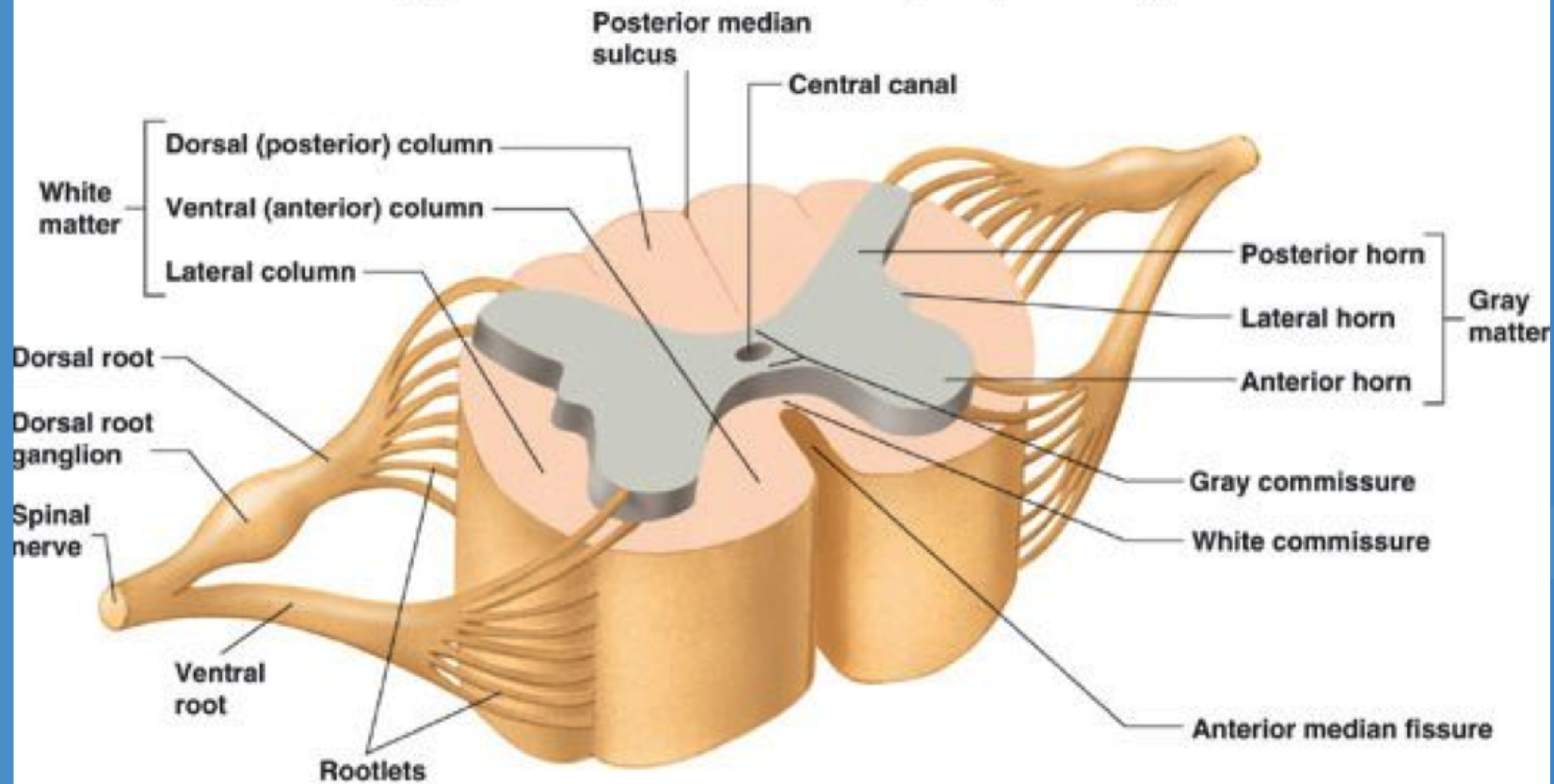
- Sensory and motor roots bound together
- Mixed nerves
 - contain both afferent and efferent fibers
- 31 pairs
- 3 connective tissue layers
 - Epineurium
 - Perineurium
 - Endoneurium
- Dermatome
 - region that a spinal nerve pair monitors

Gray Matter

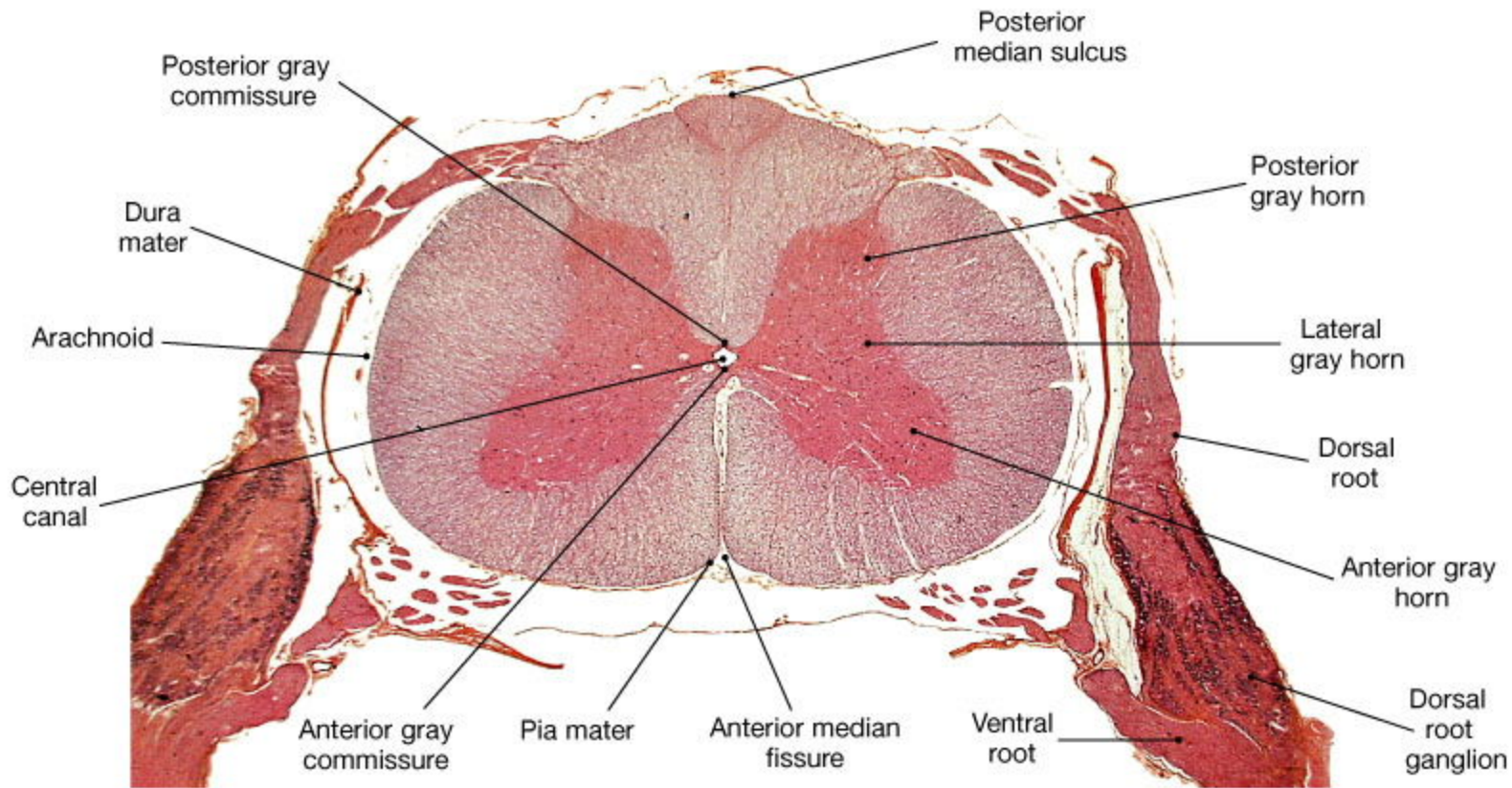
- **Posterior Gray Horns**
 - somatic & visceral sensory
- **Anterior Gray Horns**
 - somatic motor
- **Lateral Gray Horns**
 - visceral motor
- **Gray Commissures**
 - connect sides of spinal cord

White Matter

- **Posterior White Columns**
 - between posterior gray horns & posterior median sulcus
- **Anterior White Columns**
 - between anterior gray horns & anterior median sulcus
- **Anterior White Commissure**
 - connects the anterior columns
- **Lateral White Columns**
 - connect anterior and posterior columns
- **Ascending Tracts**
 - sensory info to brain
- **Descending Tracts**
 - motor info to spinal cord



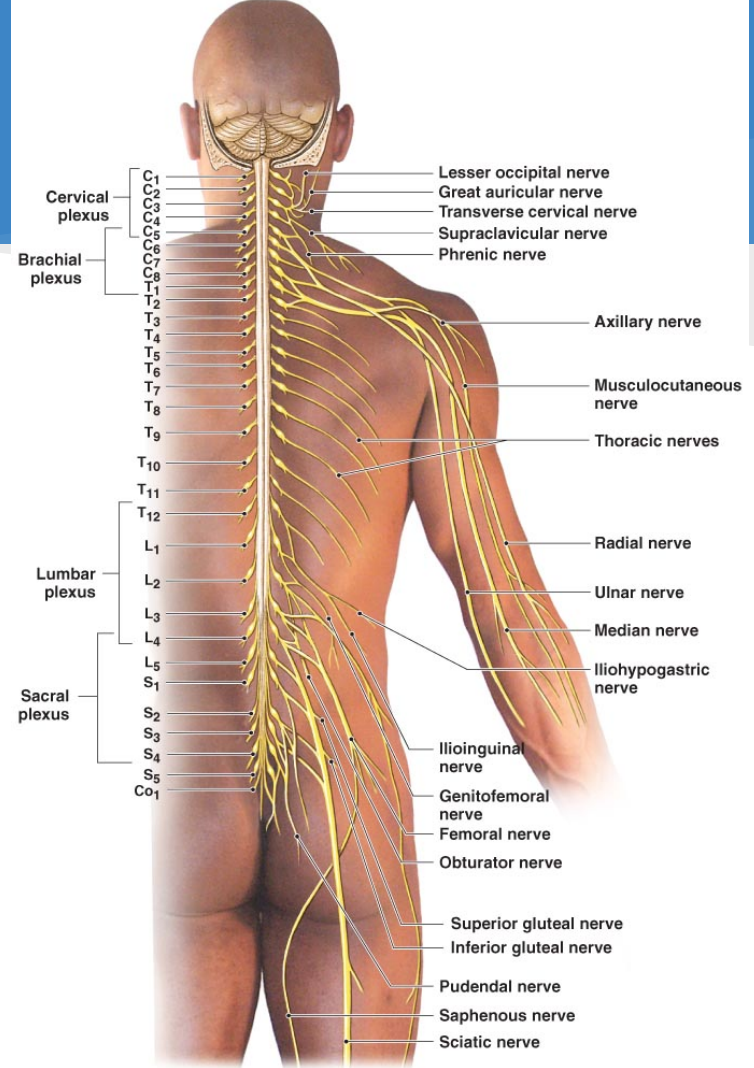
(a) Anterolateral view



(b)

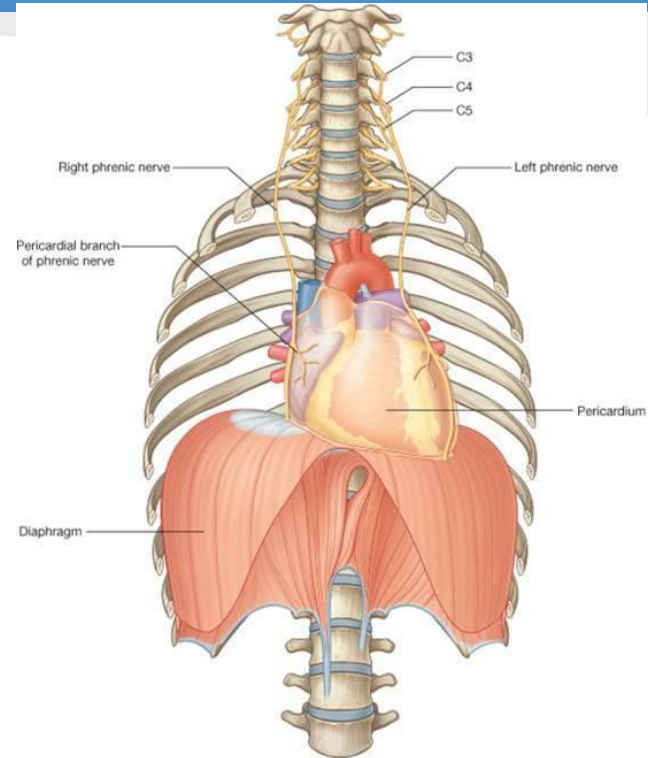
Nerve Plexus

- Series of compound nerve trunks
 - Cervical Plexus
 - Brachial Plexus
 - Lumbar Plexus
 - Sacral Plexus



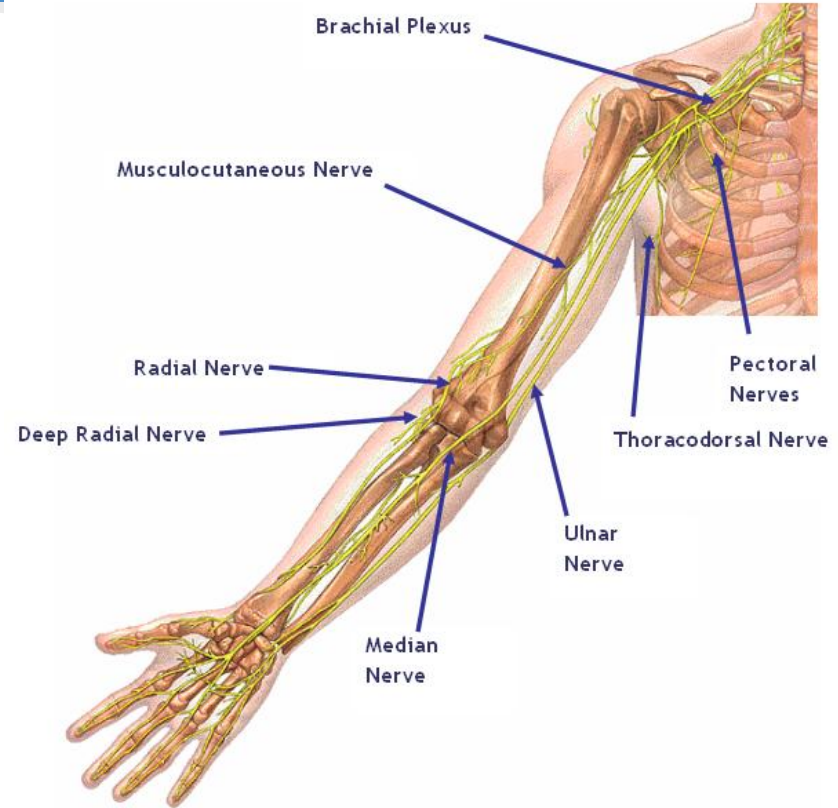
Cervical Plexus

- C1-C5
- Neck & thoracic activity
- Major Nerve(s):
 - Phrenic Nerve
 - innervates the diaphragm



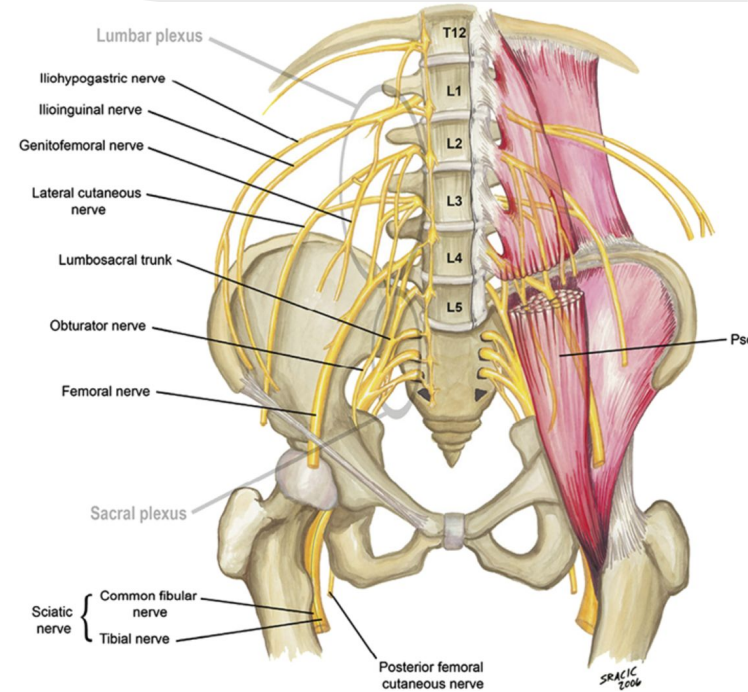
Brachial Plexus

- C5-T1
- Pectoral girdle & arms
- Major Nerve(s):
 - Median Nerve
 - forearm
 - Ulnar Nerve
 - flexor arm muscles
 - Radial Nerve
 - extensor arm muscles
 - Axillary Nerve
 - deltoid muscle
 - Musculocutaneous Nerve
 - upper arm muscles



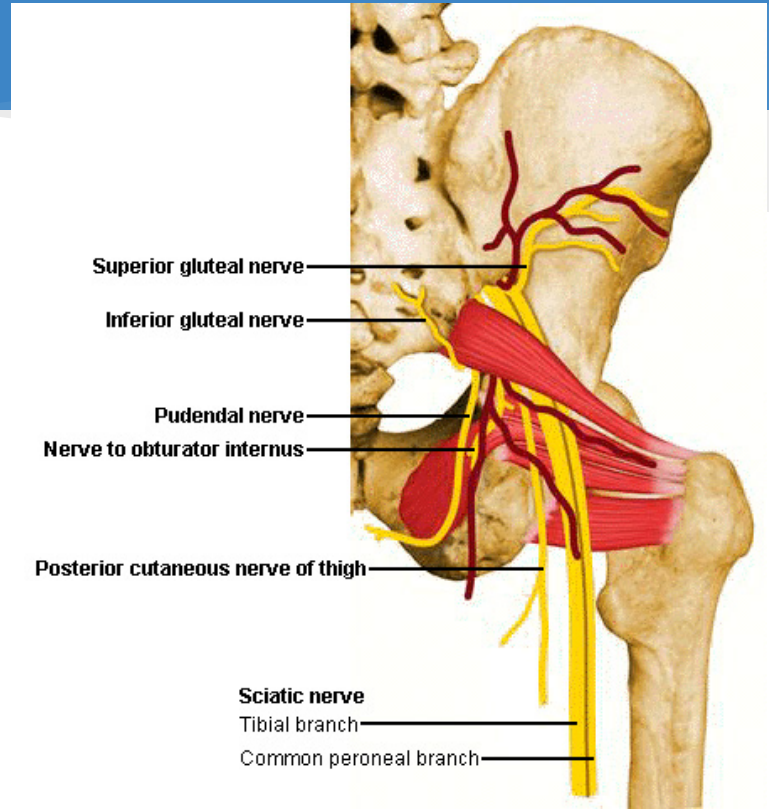
Lumbar Plexus

- T12-L4
- Upper Legs
- Major Nerve(s):
 - Genitofemoral Nerve
 - thighs & genitalia
 - Lateral Femoral Cutaneous Nerve
 - thighs
 - Femoral Nerve
 - thighs & hips



Sacral Plexus

- L4-S4
- Lower Legs
- Major Nerve(s):
 - Sciatic Nerve
 - thigh
 - Fibular Nerve
 - front of lower leg
 - Tibial Nerve
 - back of lower leg
 - Pudendal Nerve
 - genitalia & anal/urethral sphincters



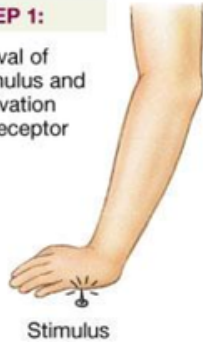
Reflex

- Automatic response to stimuli
- Sensory fibers deliver the information while motor fibers carry commands
- Monosynaptic Reflex
 - sensory neuron synapses directly with motor neuron
- Polysynaptic Reflex
 - sensory neuron synapses with an interneuron, then a motor neuron

Reflex Arc

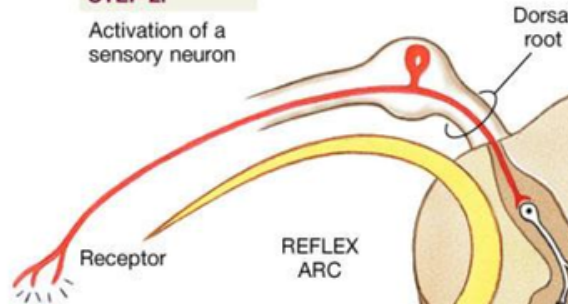
STEP 1:

Arrival of stimulus and activation of receptor



STEP 2:

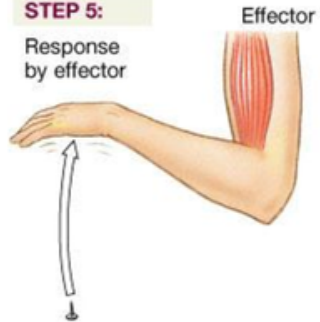
Activation of a sensory neuron



Sensation relayed to the brain by collateral

STEP 5:

Response by effector



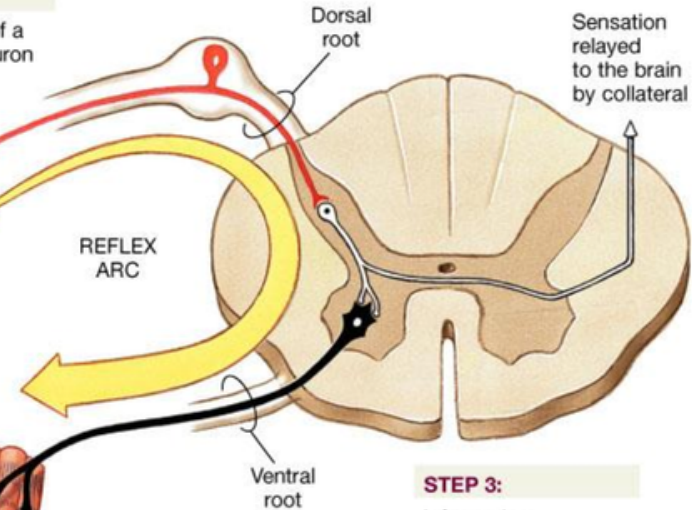
STEP 4:

Activation of a motor neuron



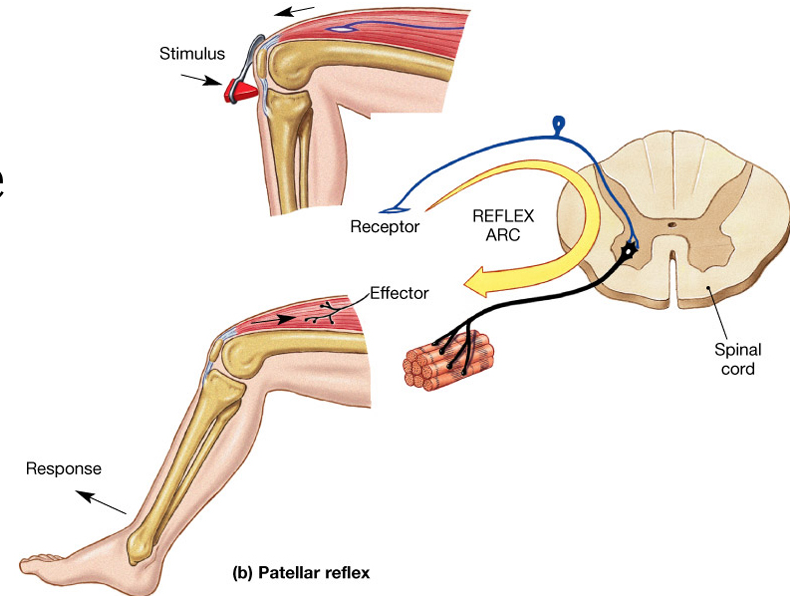
STEP 3:

Information processing in CNS



Patellar Reflex

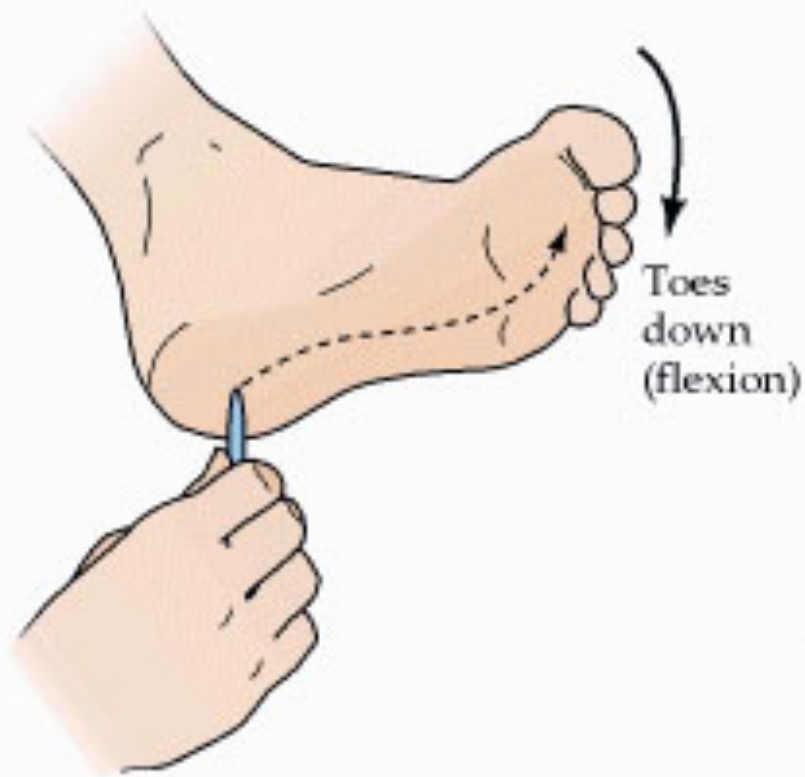
- Patellar tendon hit with reflex hammer
- Muscle receptors stretched
- Sensory neurons stimulated
- Synapse with motor neurons
- Muscle contracts, counteracting the stimulus
- Kicking reflex



Plantar & Babinski Reflexes

- **Plantar Reflex**
 - stroking the sole of the foot in an adult causes toes to curl
- **Babinski Reflex**
 - stroking the sole of the foot in an infant causes toes to fan
- If there is damage to the CNS, the Babinski Reflex reappears

(A) Normal plantar response



(B) Extensor plantar response (Babinski sign)

