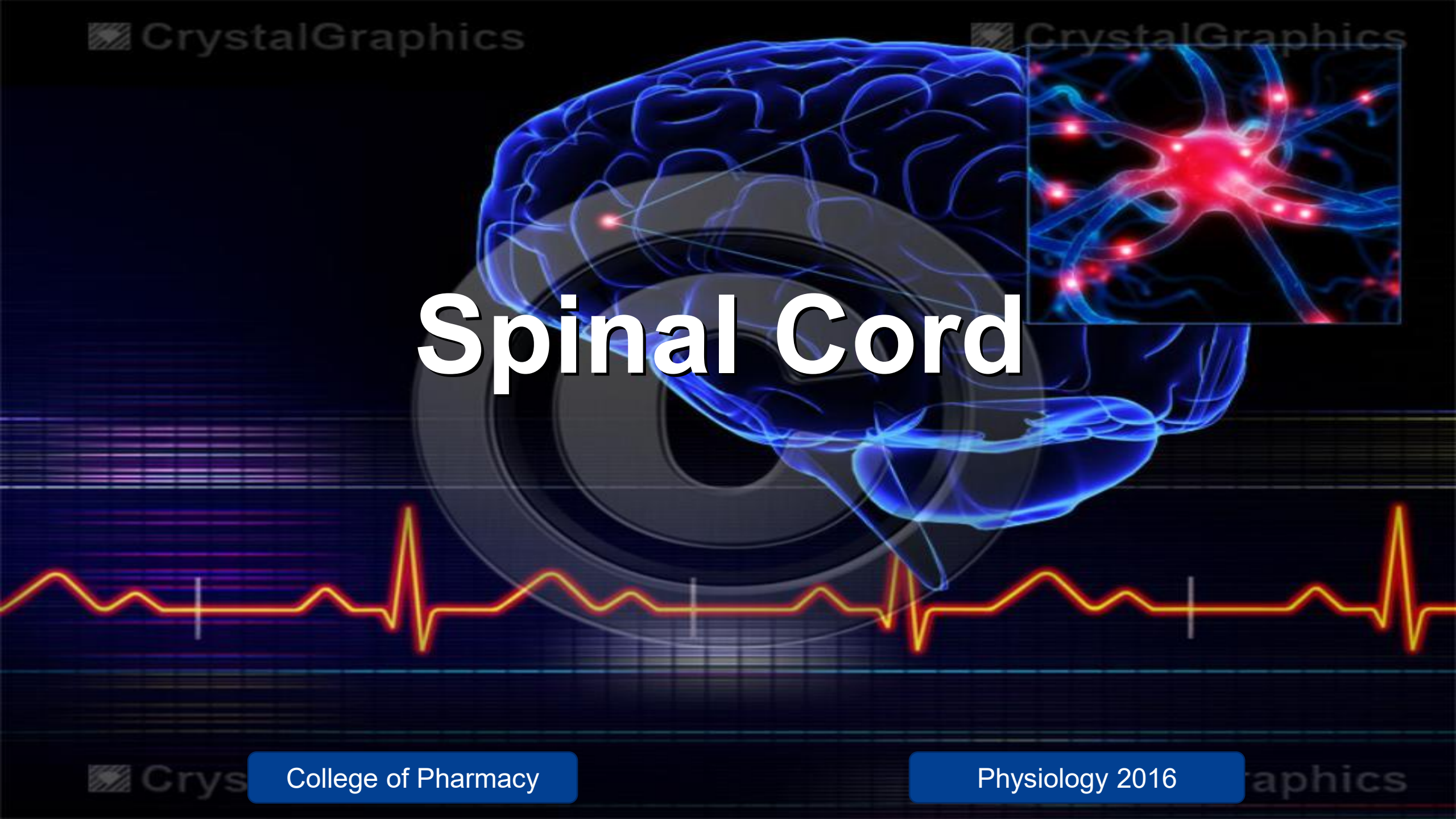
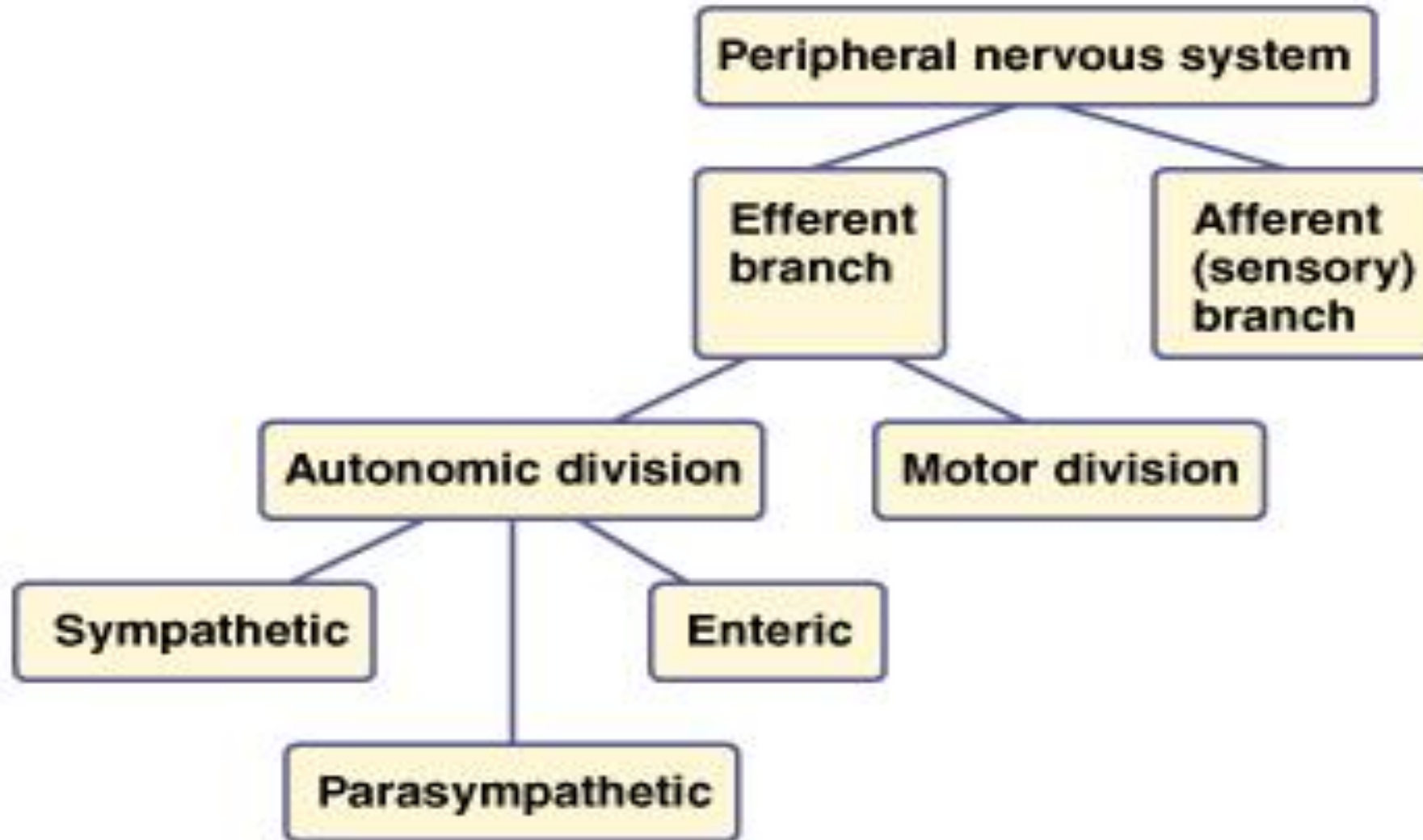


Spinal Cord



Divisions of Peripheral NS



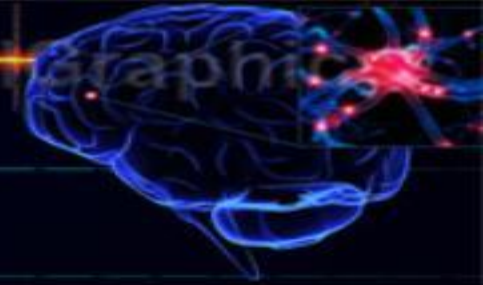
Spinal Cord

- The lowest level of the CNS (anatomically & functionally).
- The SC passes through the vertebral canal of the vertebral column to the 1st or 2nd lumbar vertebra.
- The SC is divided into 4 anatomical regions: cervical, thoracic, lumbar & sacral named according to the adjacent vertebrae.
- Each region is subdivided into segments. A pair of spinal nerves extends from each segment
- Impulses travel as fast at 400 km/hr within the SC.



Organization of Spinal Cord

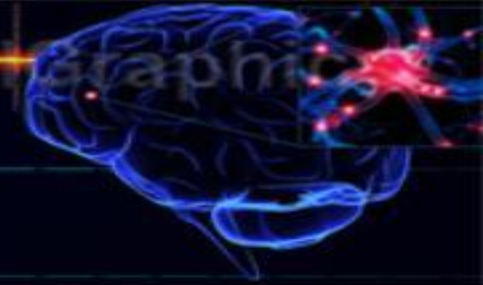
- Descending Tracts



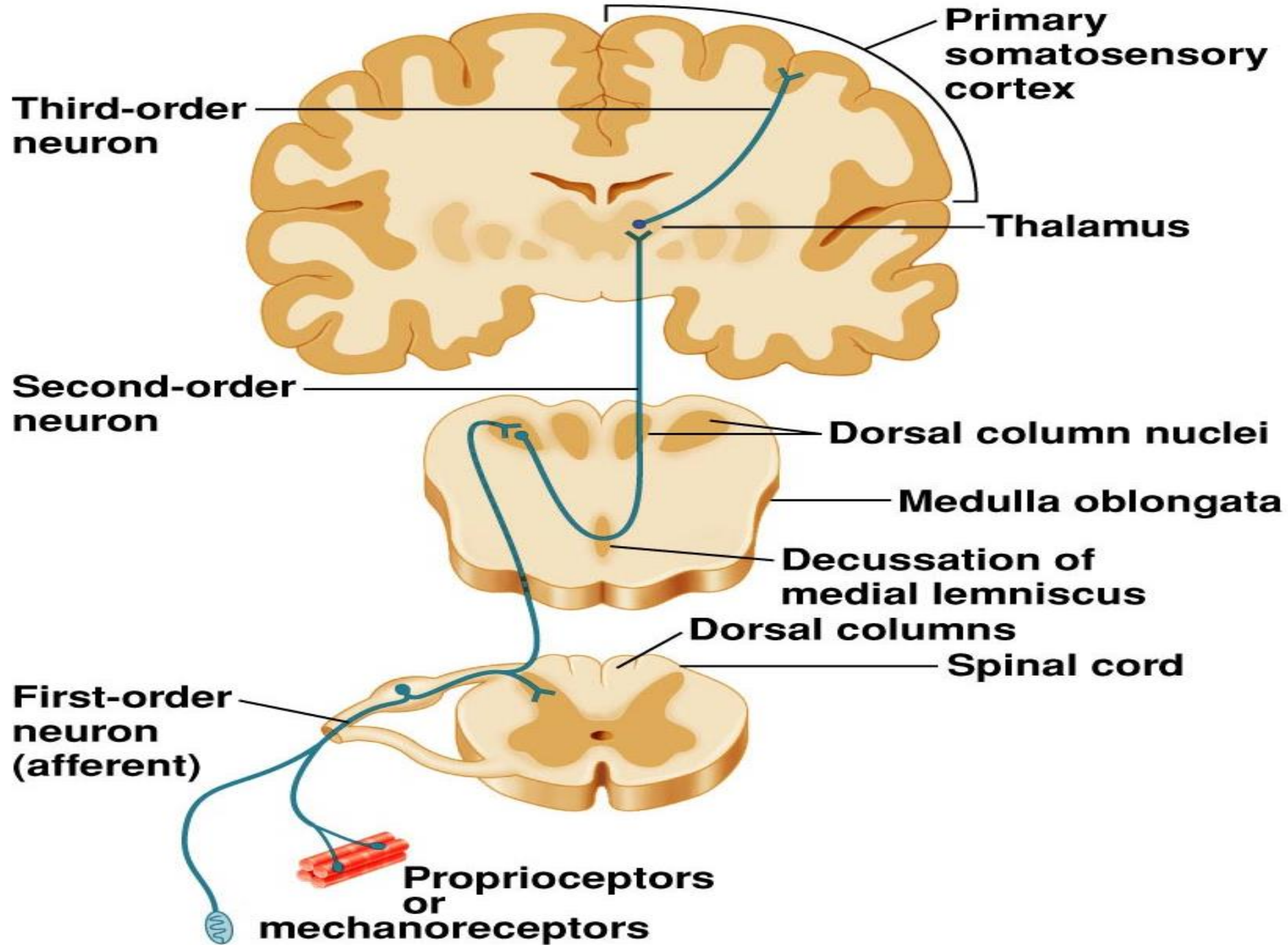
- Voluntary movement of skeletal muscles is controlled by two descending tracts.
- Neurons in these tracts terminate on and influence activity of alpha motor neurons in the ventral horn.
- The two types of tracts include:
 - Corticospinal (pyramidal) tracts
 - Multineuronal (extrapyramidal) tracts

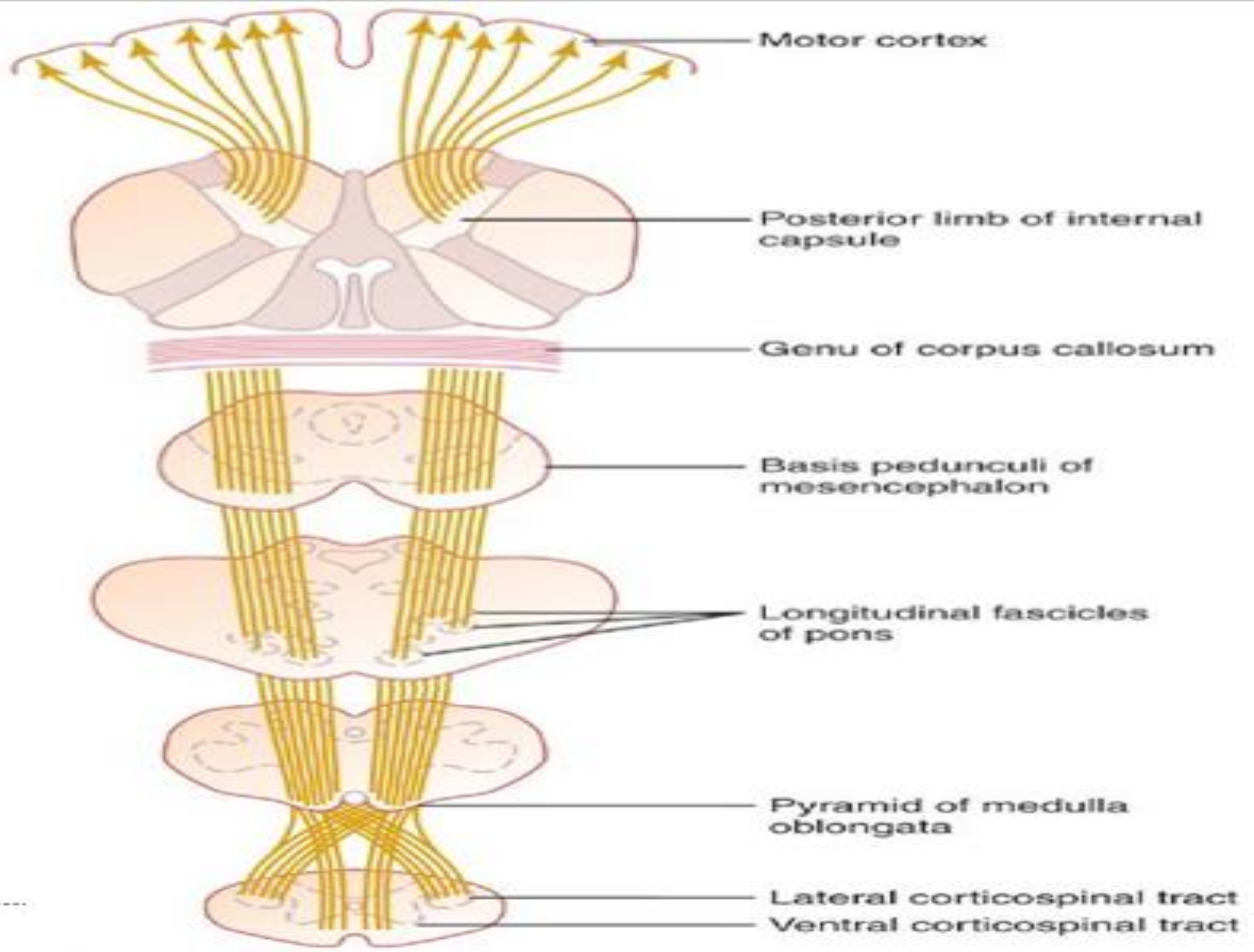
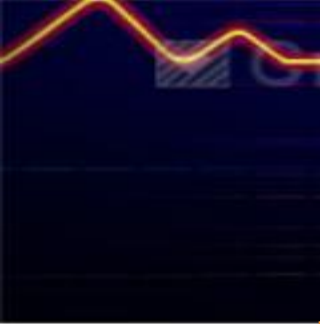
Organization of Spinal Cord

- Descending Tracts

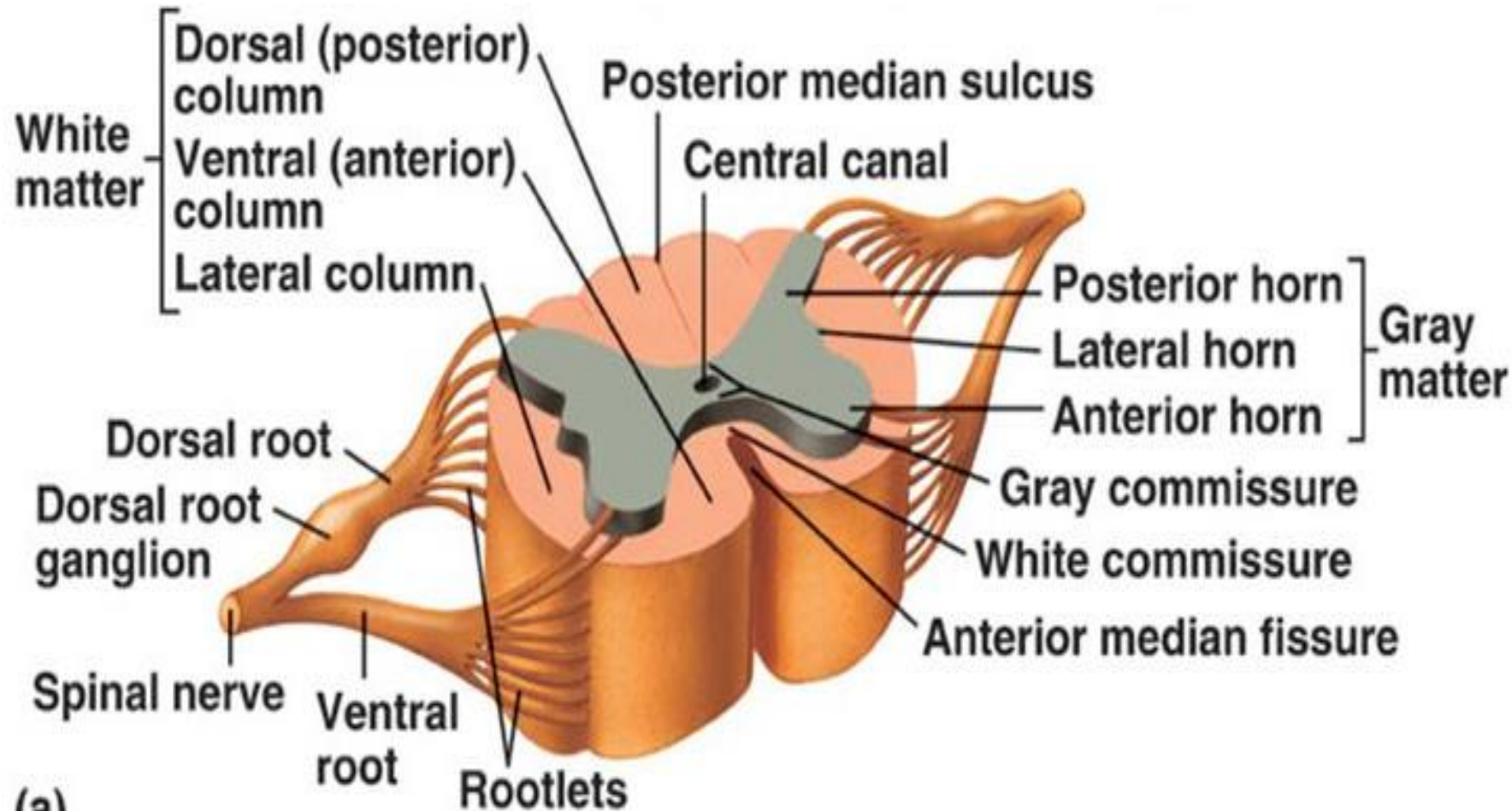


- The corticospinal tracts originate in the cerebral cortex.
- Neurons of the primary motor cortex are referred to as pyramidal cells
- As ascending tracts, descending tracts cross from one side of the CNS to the other



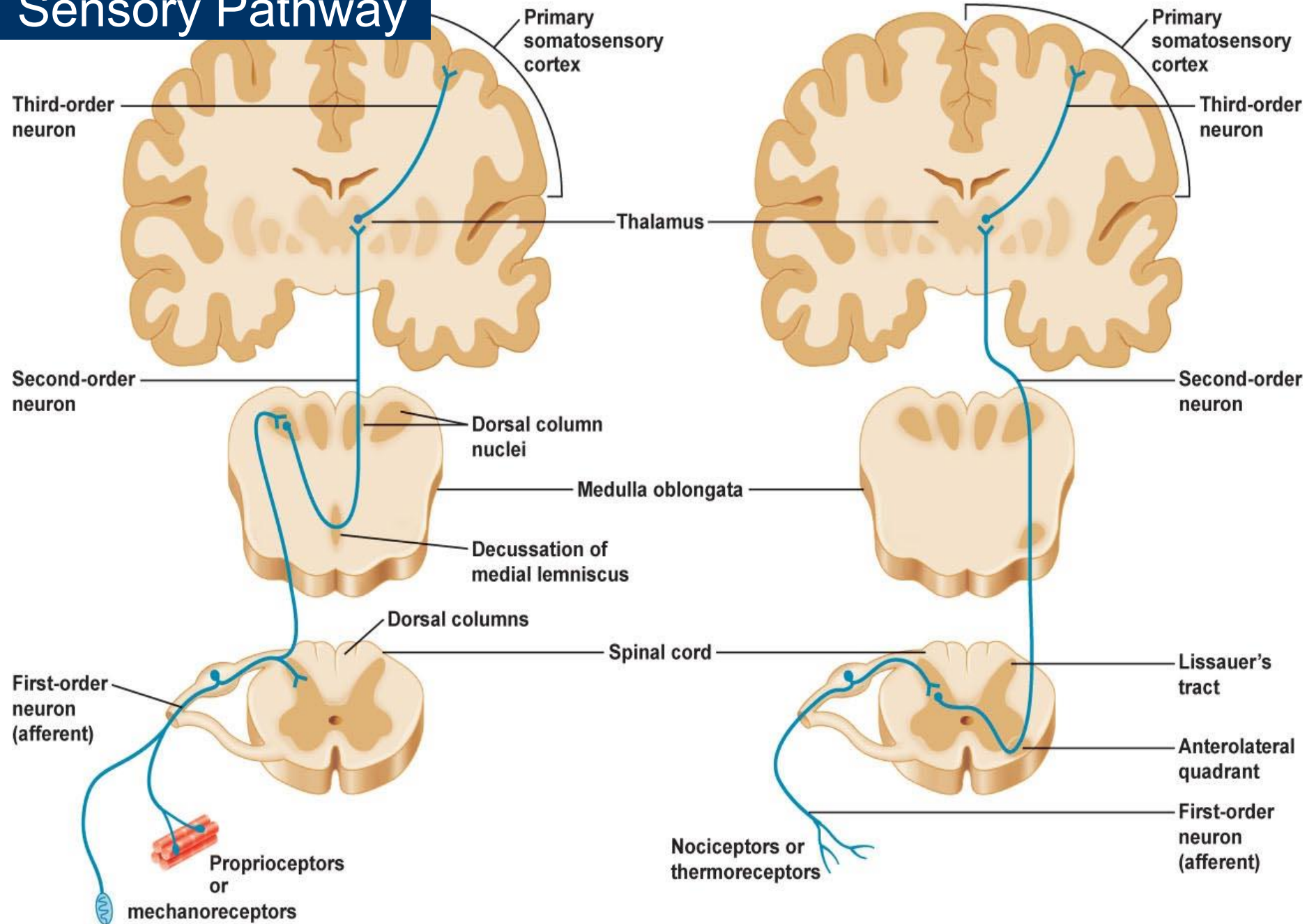


Organization of Spinal Cord



(a)

Sensory Pathway



(a) Dorsal column–medial lemniscal pathway

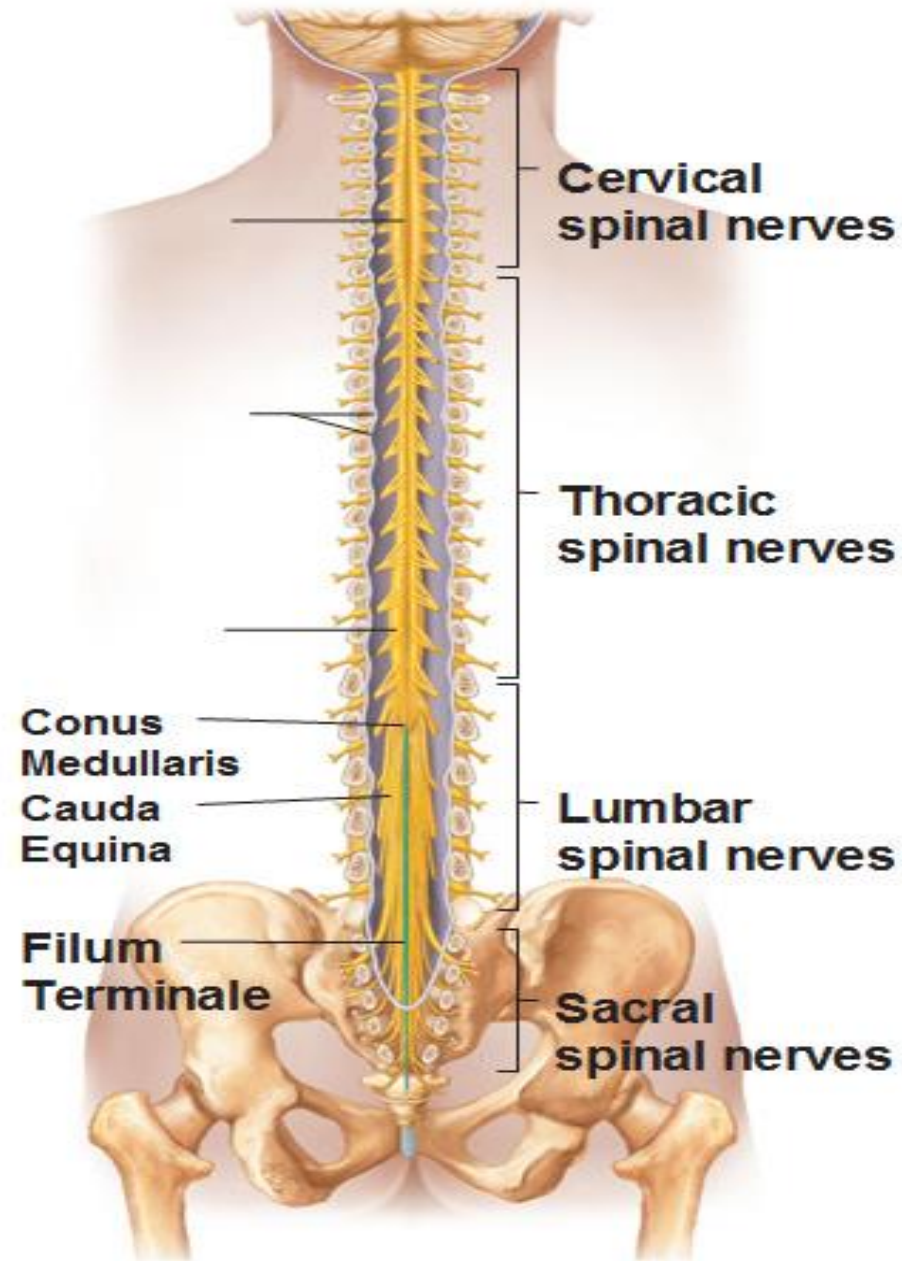
(b) Spinothalamic tract

Spinal Nerves

There are a total of (31) pairs of spinal nerves:

- 8 Cervical
- 12 Thoracic
- 5 Lumbar
- 5 Sacral
- 1 Coccygeal

The Spinal Cord

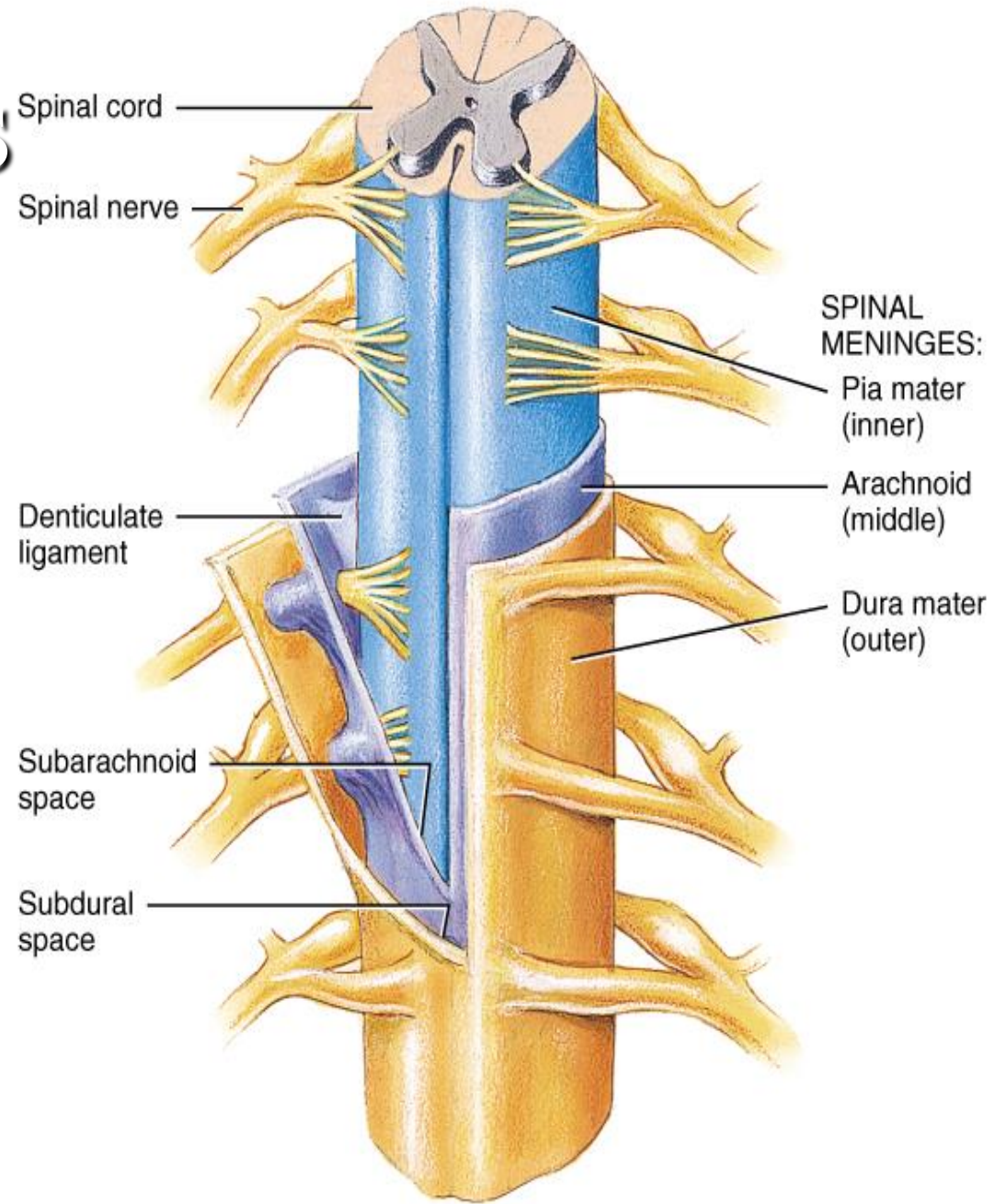


Spinal Nerves

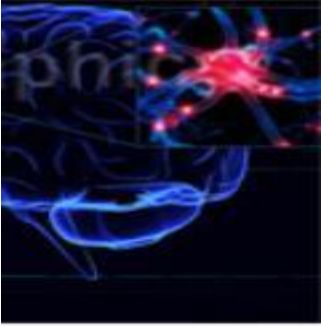
- *Cervical Nerves* are involved with sensory & motor function of the back of the head, neck, and arms.
- *Thoracic Nerves* innervate the upper trunk.
- *lumbar & sacral Nerves* innervate the lower trunk, back & legs.

Spinal Nerves

- Lateral fusion of ventral & dorsal roots
- Part of PNS



(a) Anterior view and transverse section through spinal cord



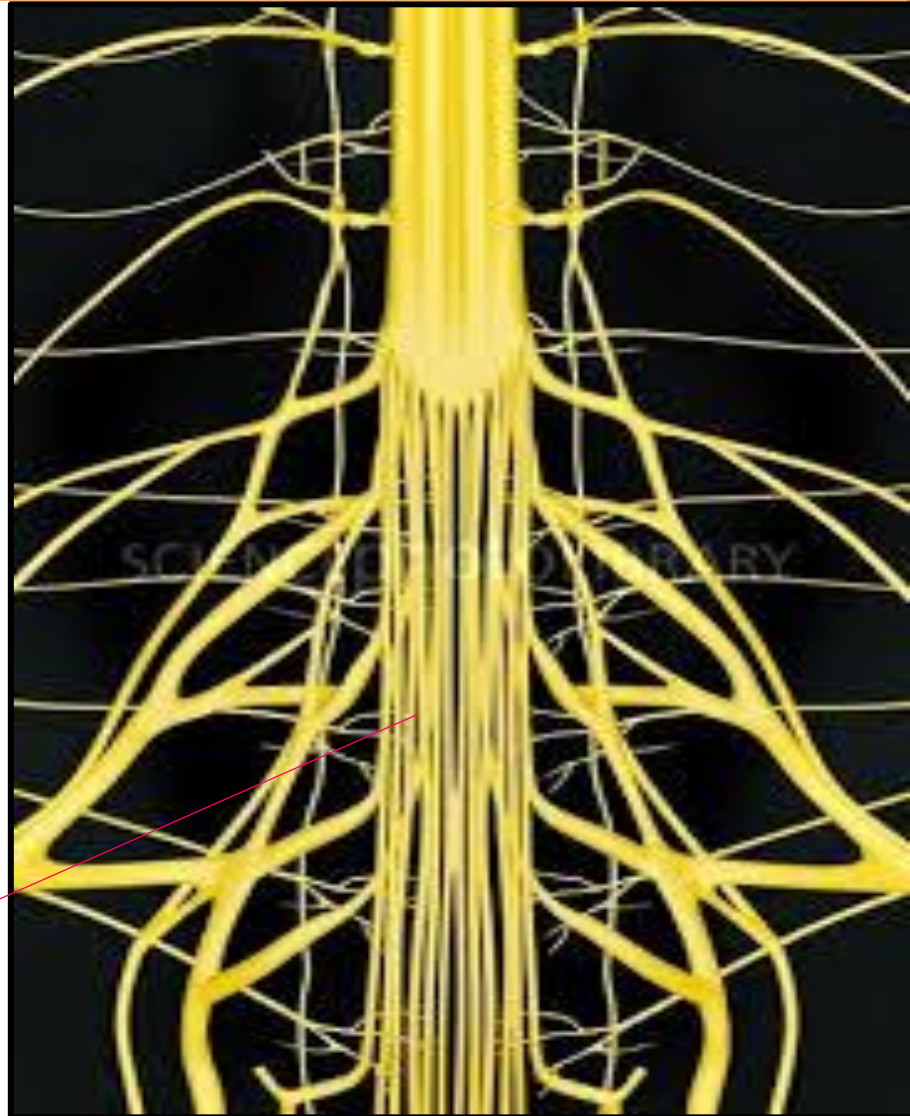
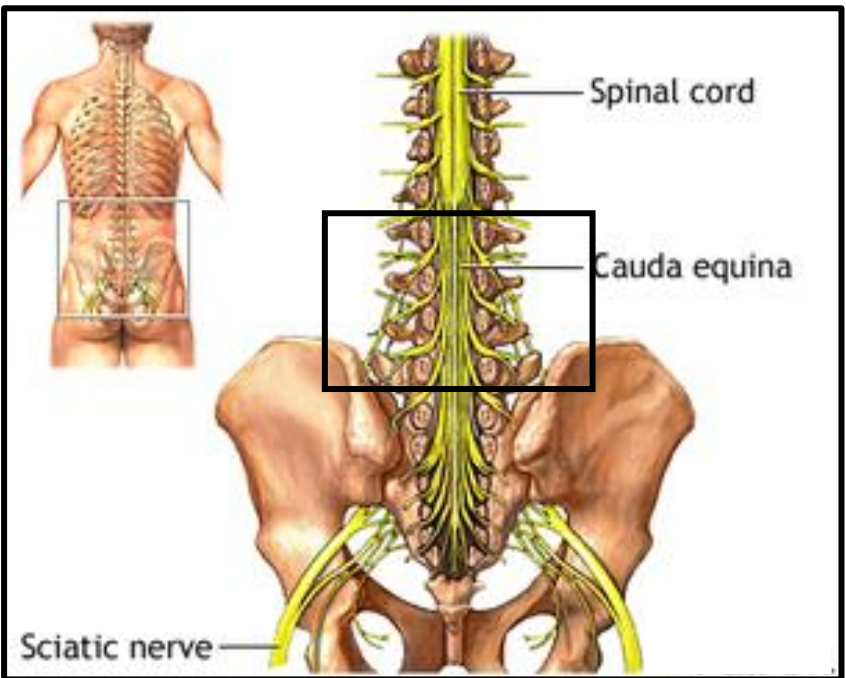
Spinal Nerves

- Lesions of the SC interrupt sensory & motor function.
- The affected regions of the body lie below the lesion level.
- Interestingly, the phrenic nerves supply the diaphragm (the major inspiratory muscle), arise from C3-C5. Therefore, only lesions high in the cervical region will affect breathing.

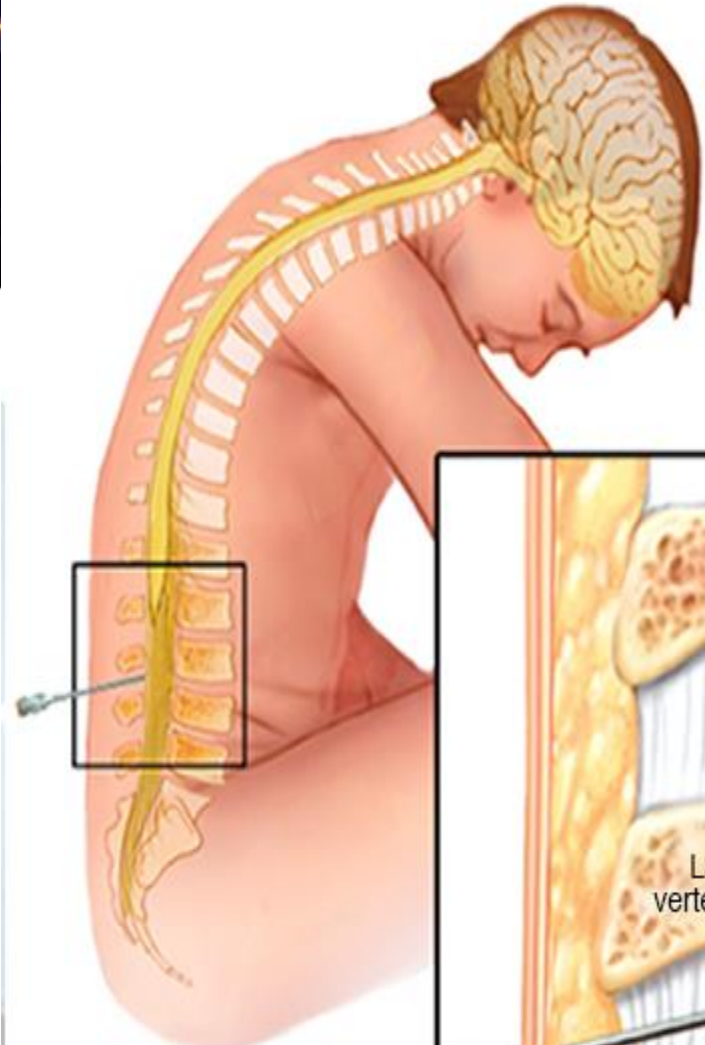
Spinal Nerves

- The lowermost part of SC is called “**Cauda equina or Horse’s tail**” due to its appearance
- A sample of cerebrospinal fluid may be obtained here by a “**lumbar puncture or spinal tap**”.
- A needle may be safely inserted into the vertebral canal without the risk of penetrating the SC. The spinal roots are easily pushed aside by the needle, significantly reducing the possibility of damaging the nerves.

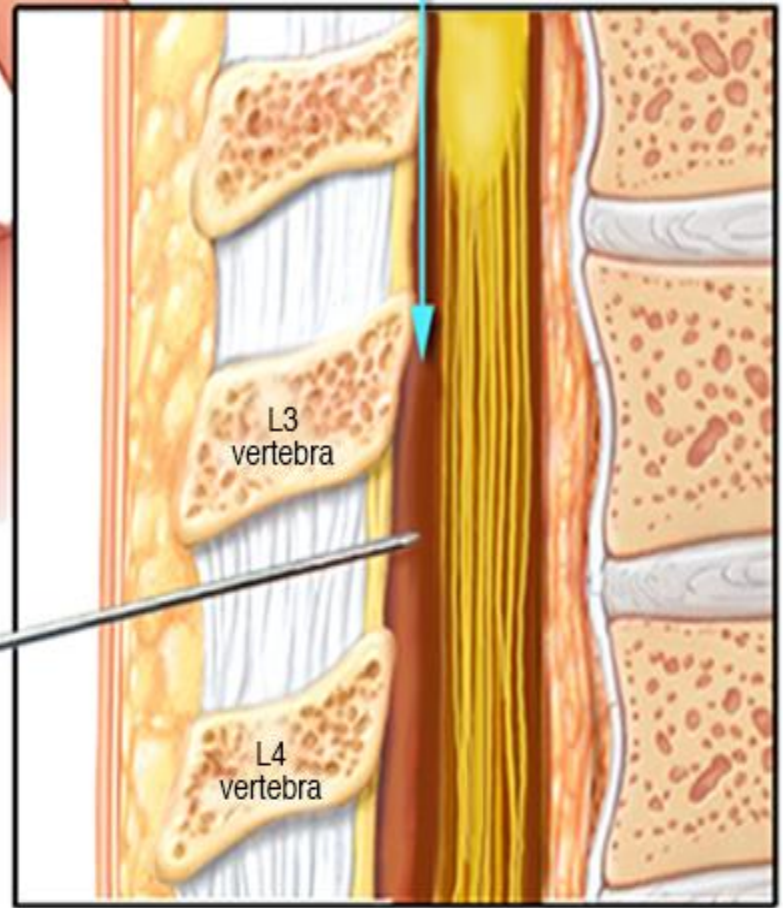
Spinal Nerves



Cauda Equina



Cerebrospinal fluid, collected from the thecal sac that surrounds the spinal cord



Needle

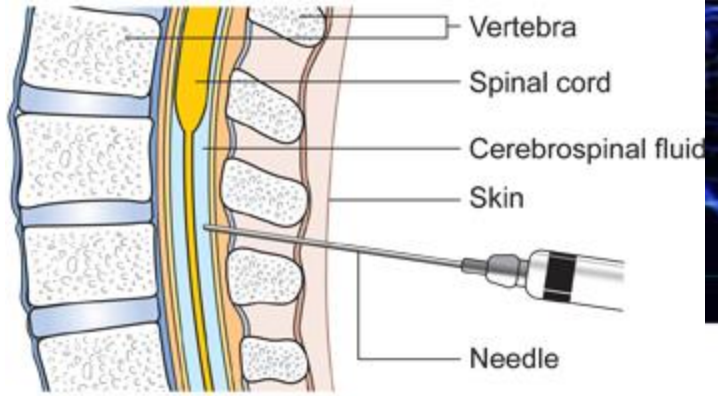
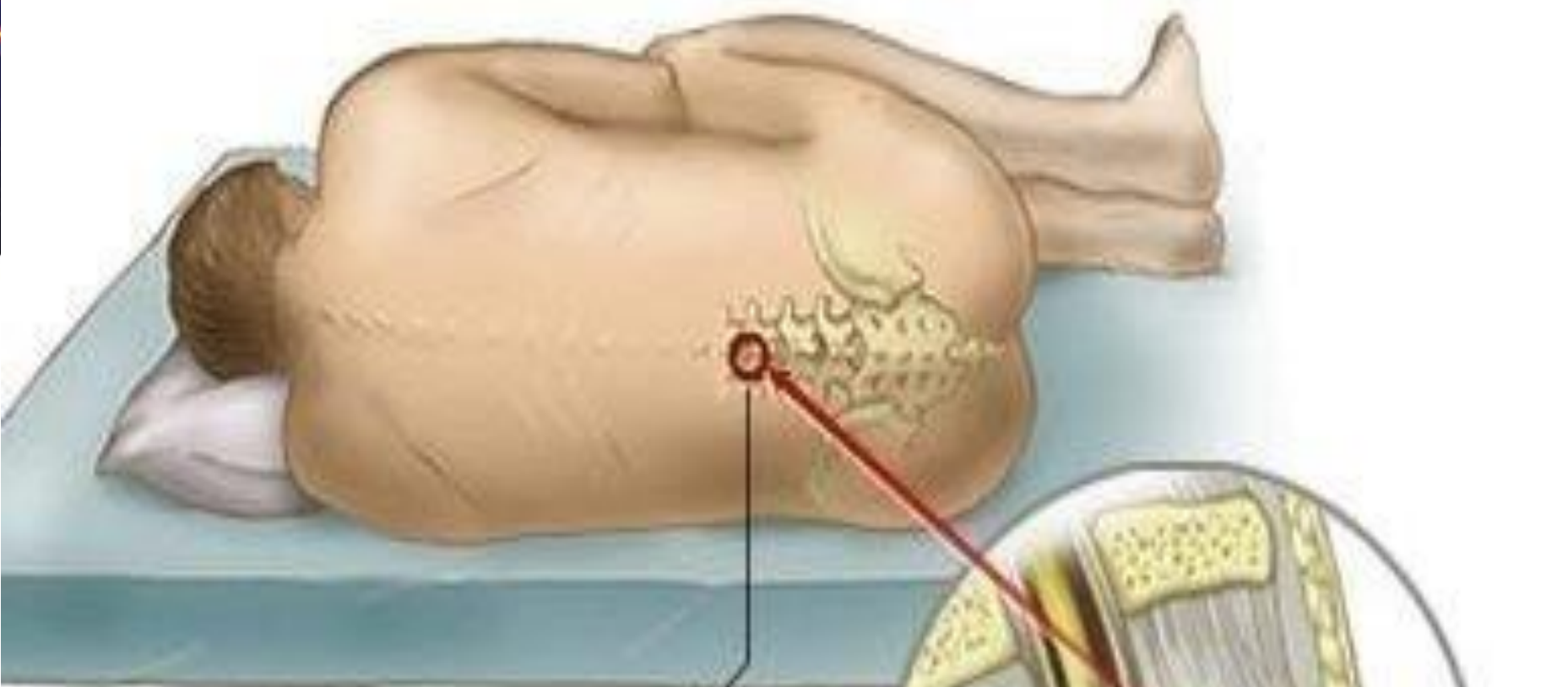
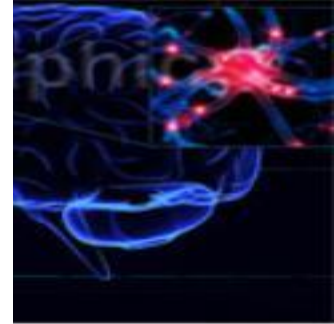
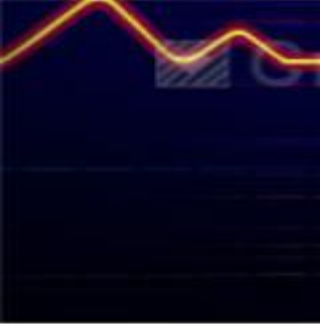


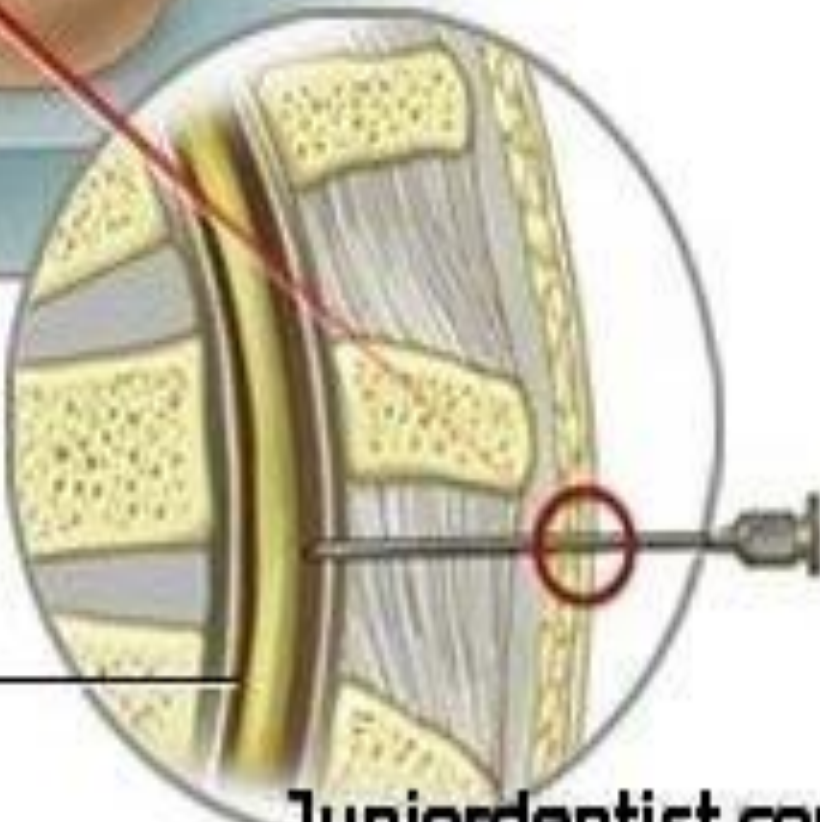
Diagram showing how you have a lumbar puncture





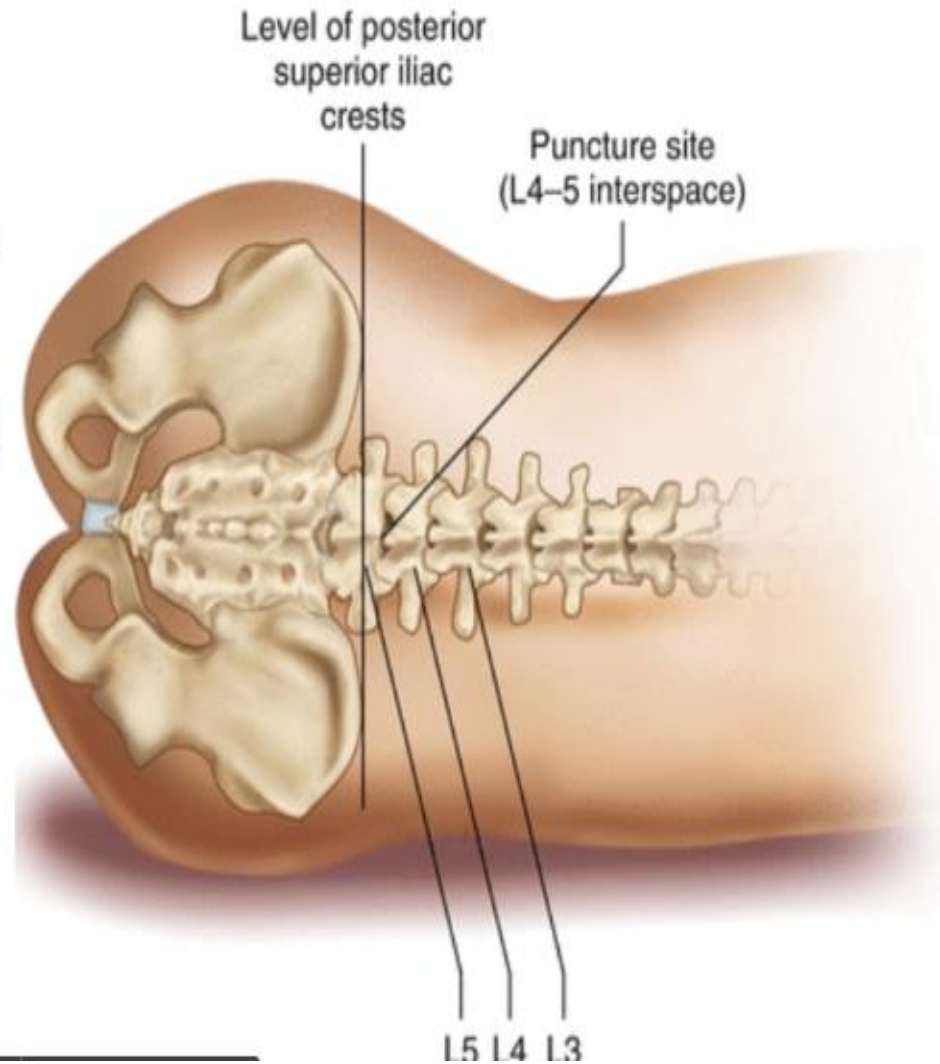
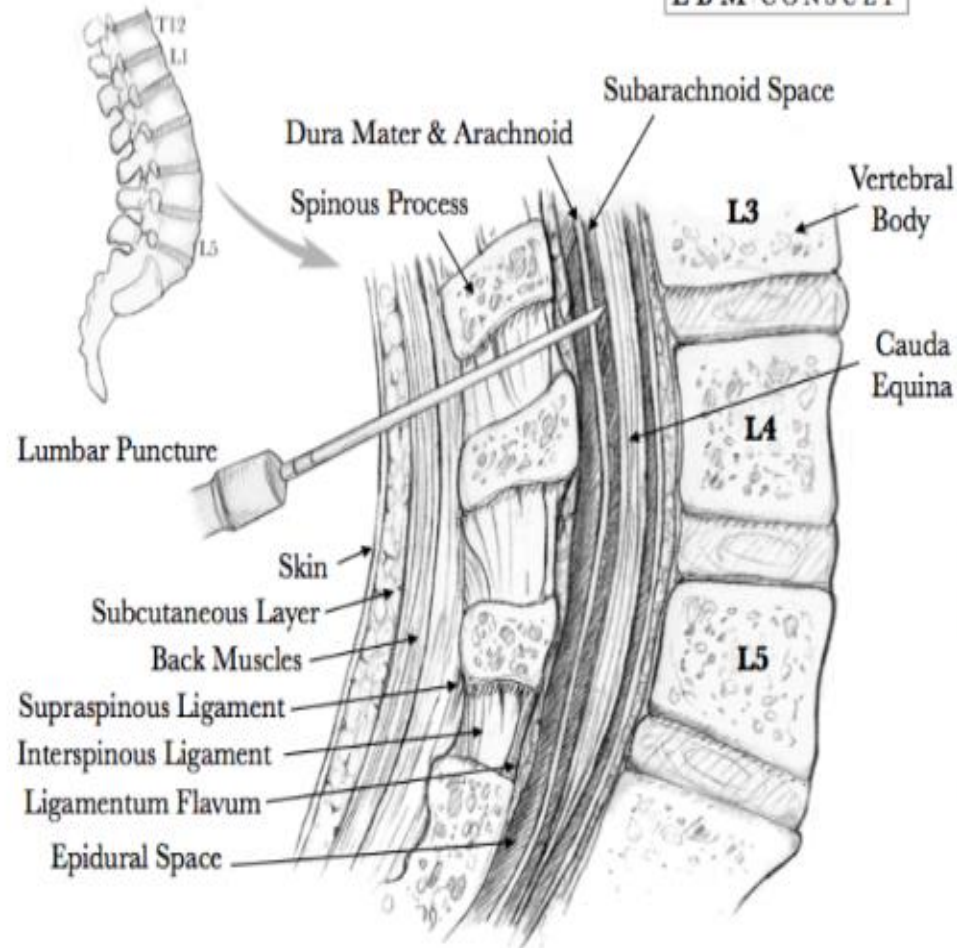
**Spinal needle is inserted
between 3rd and 4th
lumbar vertebrae.**

**Cerebrospinal
fluid**



Cerebrospinal Fluid (CSF)

Lumbar Puncture

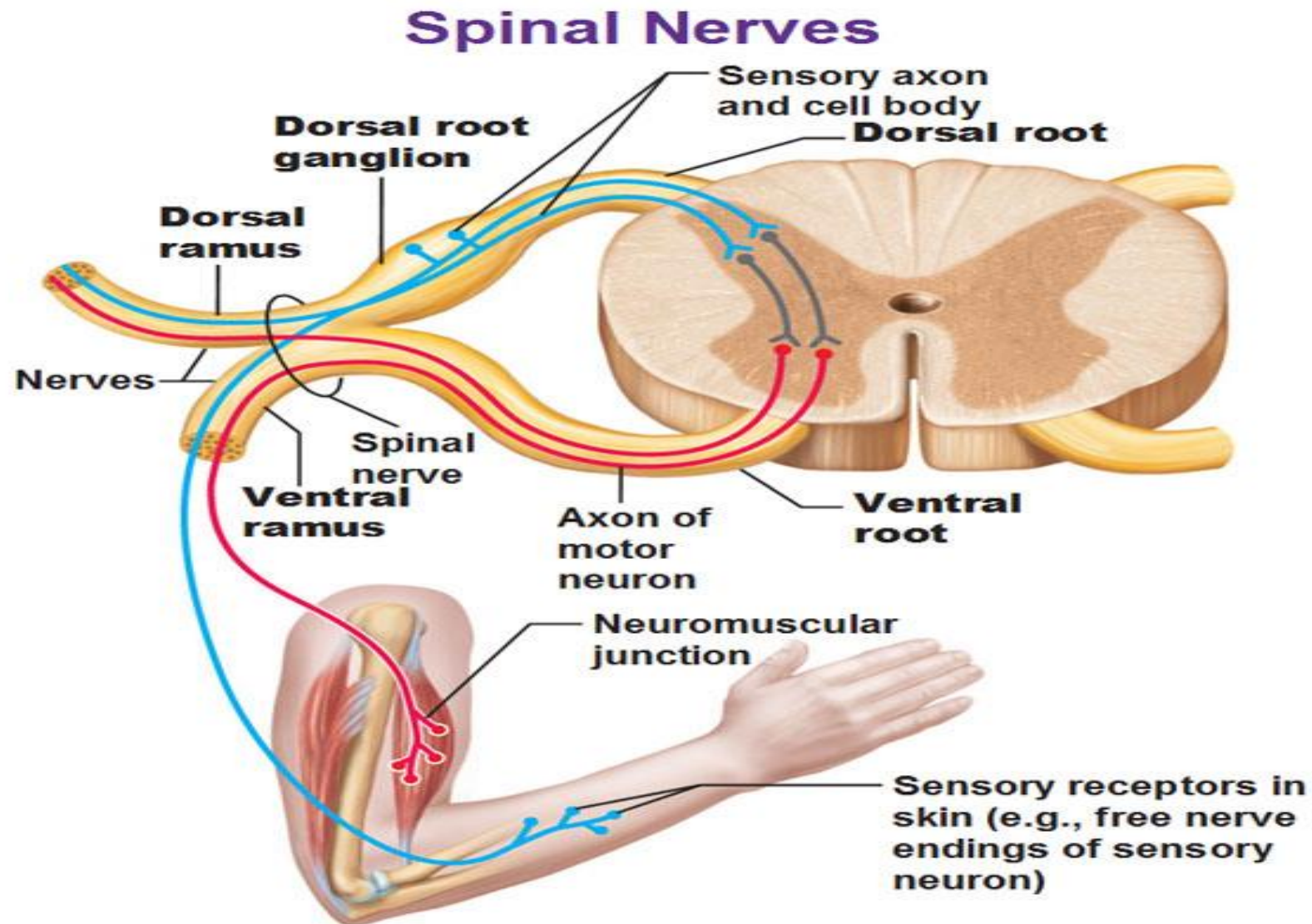


Spinal Nerves

The spinal nerves associate with the SC by two branches (roots):

- **Dorsal root:** afferent, sensory neurons, transmit impulses from periphery toward the SC.
- **Ventral root:** efferent, motor neurons, transmit impulses from SC toward the periphery.

Spinal Nerves



Spinal Nerves

- Nerve is a bundle of neuronal axons (afferent & efferent), consist only of axons (not entire neurons).
- Nerves are found only in the PNS, not in the CNS.
- Within the CNS; bundles of neurons with similar functions are referred to as “tracts”.



Functions of the Spinal Cord

The SC is responsible for vital CNS functions:

- 1- Conducts nerve impulses to & from the brain
- 2- Processes sensory input from the skin, joints & muscles.
- 3- Initiates reflex responses to this input.



THANK YOU