Neural Pathways & Tracts (LO2)

"Using principles NP1, NC2 and NC3 define the term "neural pathway" and draw a simple sensory and motor neural pathway in relation to components of the nervous system. Define what is meant by the terms sensation and perception in relation to a sensory neural pathway."

NP1: Neurons normally transmit impulses in one direction only

NC3: Pathways or tracts along the CNS can be ascending or descending

Ipsilateral = on the same side

Contralateral = on the opposite side

Stimuli = changes in the internal or external environment

Sensation = awareness of changes in our internal and external environment

Perception = conscious interpretation of the meaning of the stimuli

Somatosensory Pathways

There are **three neurons within this circuit**. A **somatic afferent sensory pathway carries sensory information towards the CNS from structures towards the body wall**

1. **Primary sensory neuron (first order sensory neuron)**
   - Conducts impulses from cutaneous receptors of skin to the ***spinal cord*** or ***brain stem***
   - Nerve endings act as ***sensory receptors***
   - ***Cell body*** located within the ***peripheral nervous system*** within the ***dorsal root ganglion (DRG)***
   - ***Synapses with second order neuron inside the CNS (****specifically within the spinal cord)*

2. **Second order neuron**
   - Found within the CNS
   - ***Cell body*** found in the ***brain stem*** or ***dorsal horn of spinal cord***
   - Found on the same side where the sensation is occurring (***ipsilateral***)
   - Axon ***decussates*** (crosses over) from the ***ipsilateral*** side to the ***contralateral*** side
   - ***Synapses with third order neuron in thalamus***

3. **Third order**
   - Cell body is ***contralateral*** to the site of the stimulus
   - Cell body located in the ***thalamus***
   - Projects to the ***primary sensory cortex of cerebrum***

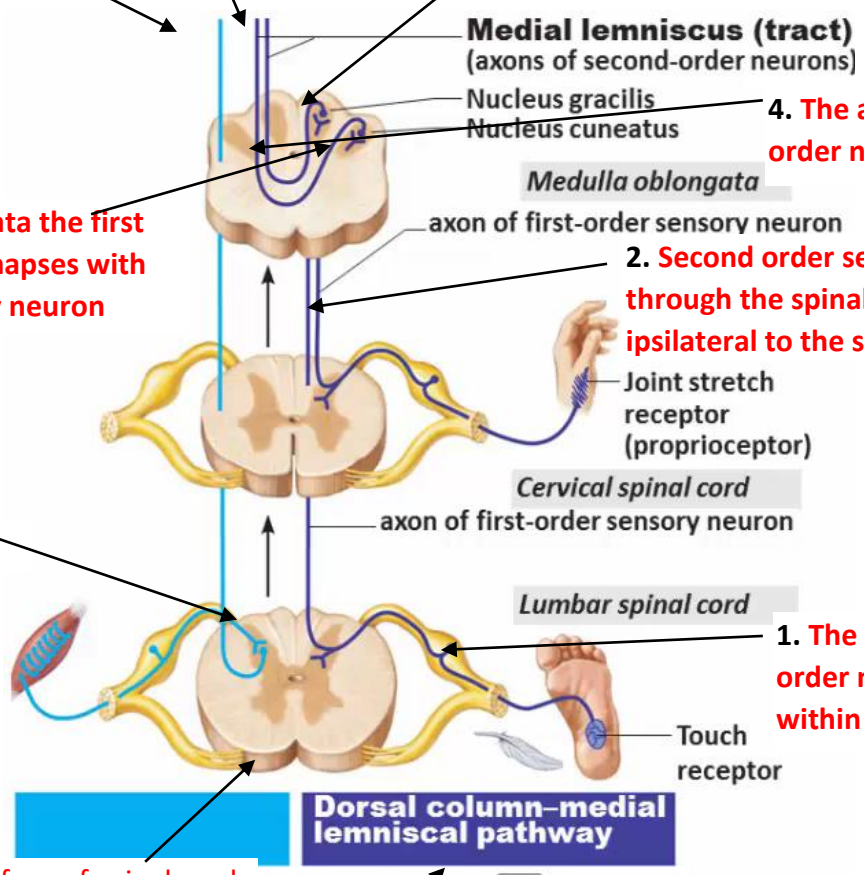
A collection of nerve cell bodies **outside the CNS** is called **ganglion** or a **ganglia**

A collection of nerve cell bodies **inside the CNS** is called a **nuclei**

5. The spinothalamic tracts of the second order neuron carry somatosensory information up to the thalamus where they synapse with a third order neuron. The third order neuron then relays the appropriate information to the somatosensory cortex

3. First order sensory neuron synapses onto second order neuron ipsilaterally to the site of sensation

This is a diagram of a person facing you



4. The axon of the second order neuron decussates

3. In the medulla oblongata the first order sensory neuron synapses with the second order sensory neuron

2. Second order sensory neuron ascends through the spinal cord to the CNS ipsilateral to the site of sensation

Dorsal surface of spinal cord

1. The cell body of the first order neuron is contained within the dorsal root ganglion

Ventral surface of spinal cord

The dorsal column-medial lemniscal pathway is named because it runs through the dorsal section of the spinal cord all the way up to medial leminiscal. This is an illustration of principle NC2

NC2: Neural tracts are usually named according to the origin and destination of the signal being transmitted along the nerve fibres