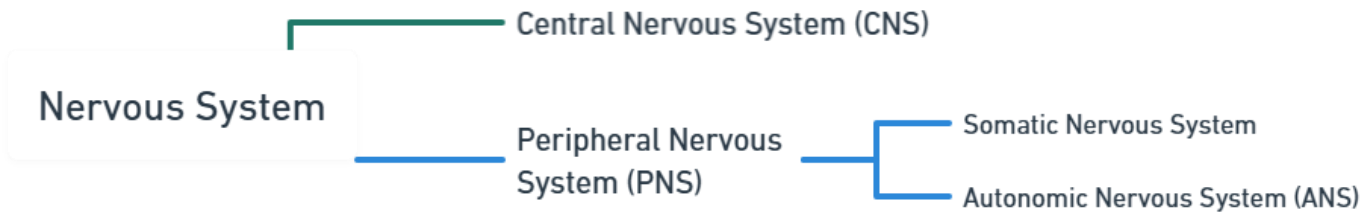


Nervous system

Introduction Of Nervous System

- The nervous system is a complex network of neurons that transmit signals throughout the body, coordinating and controlling a wide range of functions, from voluntary movements to involuntary processes like homeostasis and internal organ regulation.

Main Divisions of the Nervous System



1. Central Nervous System (CNS):

- Composed of the **brain** and **spinal cord**.
- Acts as the primary control center, processing sensory information, generating thoughts and emotions, and coordinating movements.

2. Peripheral Nervous System (PNS):

- Consists of all nerves outside the CNS, connecting it to the rest of the body.
- **Subdivisions:**

A. Somatic Nervous System:

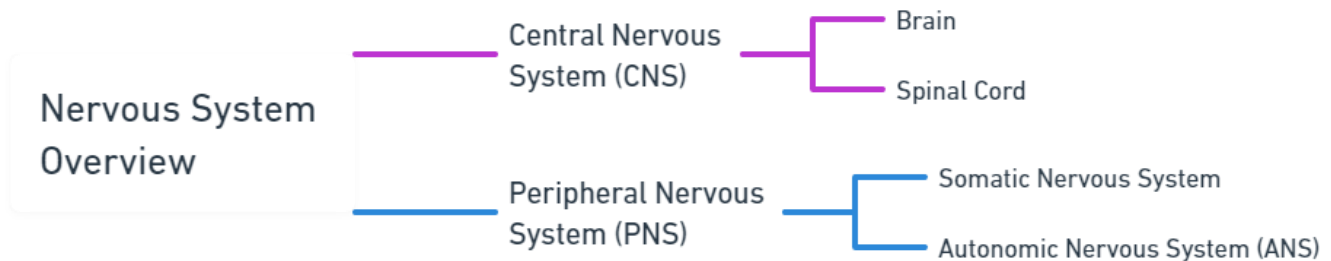
- Controls voluntary movements and perceives external sensations (touch, pain, temperature).
- It includes sensory neurons (body to CNS) and motor neurons (CNS to muscles).

B. Autonomic Nervous System (ANS):

- Regulates involuntary processes and internal organ functions. It has two parts:
 - I. **Sympathetic Nervous System:** Activates the "fight or flight" response during stress.
 - II. **Parasympathetic Nervous System:** Promotes the "rest and digest" state, helping the body relax and conserve energy.

Classification of the Nervous System

- The nervous system is organized into two main divisions:
 - **Central Nervous System (CNS)**
 - **Peripheral Nervous System (PNS)**
- Each division contains its own subdivisions and components that work together to coordinate and control various bodily functions.



1. Central Nervous System (CNS)

The CNS is the control center of the body and includes:

A. Brain

- The brain is responsible for processing and integrating sensory information, generating thoughts and emotions, and coordinating voluntary and involuntary movements.
- **Major parts of the brain include:**
 - **Cerebrum**
 - **Cerebellum**
 - **Brainstem**

B. Spinal Cord

- The spinal cord is a long, cylindrical structure extending from the base of the brain down the vertebral column.
- It serves as the main communication link between the brain and the PNS.
- **It relays:**
 - **Sensory information** from the body to the brain
 - **Motor instructions** from the brain to the body

2. Peripheral Nervous System (PNS)

The PNS connects the CNS to the rest of the body and is divided into:

A. Somatic Nervous System

- Controls **voluntary movements** and **perception of external stimuli**.
- **Composed of:**
 - **Sensory neurons** – transmit information from the body to the CNS
 - **Motor neurons** – carry commands from the CNS to skeletal muscles

B. Autonomic Nervous System (ANS)

- Regulates **involuntary functions** of internal organs.
- **Subdivided into:**

I. Sympathetic Nervous System

- Activates the "**fight or flight**" response during stress
- Increases:
 - Heart rate
 - Respiration
 - Blood flow to muscles

II. Parasympathetic Nervous System

- Promotes the "**rest and digest**" state
- Functions include:
 - Slowing heart rate
 - Increasing digestion
 - Maintaining homeostasis

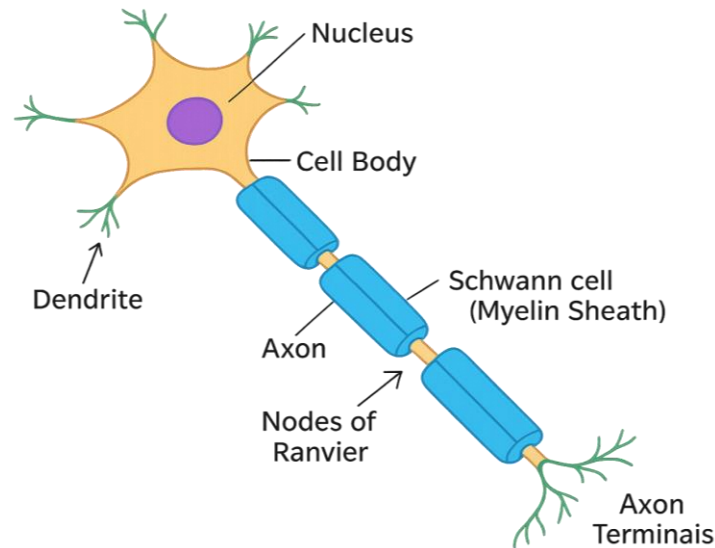
Neuron: Structure And Function

- A **neuron** is the basic unit of the nervous system, responsible for transmitting information via **electrical and chemical signals**.
- Neurons are found in the **brain, spinal cord**, and **nerves**.

Main Parts of a Neuron

1. **Cell Body (Soma):** Contains the nucleus and organelles; processes incoming signals.
2. **Dendrites:** Branch-like structures that receive signals from other neurons.
3. **Axon:** Long fiber that carries impulses away from the cell body.
4. **Myelin Sheath:** Fatty layer that insulates the axon and speeds up transmission.

5. **Nodes of Ranvier:** Gaps in myelin for rapid signal conduction.
6. **Axon Hillock:** Site where action potentials are triggered.
7. **Axon Terminals:** End branches that send signals to other cells.
8. **Synaptic Terminals:** Release neurotransmitters into the synaptic cleft.
9. **Synaptic Cleft:** Gap between neurons where neurotransmitters pass.
10. **Neurotransmitter Receptors:** Receive and respond to chemical signals.

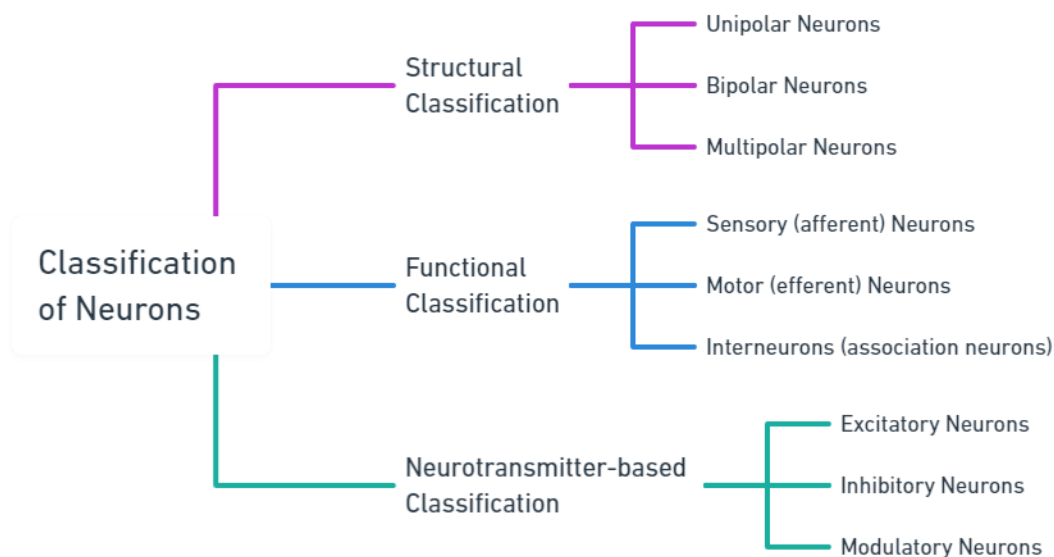


Function

- Neurons receive, process, and transmit signals, enabling fast communication within the nervous system.

Classification Of Neuron

Neurons can be classified based on **structure**, **function**, or the **neurotransmitters** they release.



1. Structural Classification

A. Unipolar Neurons

- One process from the cell body that branches into an axon and dendrite.
- Common in **invertebrates**.

B. Bipolar Neurons

- Two processes: one axon and one dendrite.
- Found in **sensory organs** like the retina and olfactory epithelium.

C. Multipolar Neurons

- One axon and **multiple dendrites**.
- Most common type in the **brain and spinal cord**.

2. Functional Classification

A. Sensory (Afferent) Neurons

- Carry signals **from sensory receptors to the CNS**.
- Detect stimuli like touch, light, or temperature.

B. Motor (Efferent) Neurons

- Transmit signals **from CNS to muscles or glands**, triggering action.

C. Interneurons (Association Neurons)

- Found **only in the CNS**.
- Connect sensory and motor neurons; form complex neural circuits.

3. Neurotransmitter-Based Classification

A. Excitatory Neurons

- Release **glutamate** or similar neurotransmitters.
- Increase the chance of target cell firing an action potential.

B. Inhibitory Neurons

- Release **GABA** or **glycine**.
- Decrease target cell excitability.

C. Modulatory Neurons

- Release **dopamine**, **serotonin**, or **acetylcholine**.



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