

Nervous System

1. Living organisms have a unique ability of responding to the changes in the environment. This is called **irritability**.
2. All living organisms have a special mechanism and organ system to identify and respond to stimulus.
3. In higher organisms, control and coordination of various body systems is brought about by the nervous and endocrine system.
4. There are three main constituents of the nervous system in higher organisms and these are:
 - (i) **Receptors:** These are organs that receive stimulus from the environment. Example, sense organs.
 - (ii) **Effectors:** These organs show visible response to stimulus. Example, muscles and glands.
 - (iii) **Conductors:** These are tissues that connect receptors and effectors, and help in the conduction of stimulus. Example, nerve cells.
5. Commonly used terms related to the nervous system are:
 - (i) **Stimulus:** It is the change in the environment that would result in change in the activity of our body.
 - (ii) **Impulse:** It is a sensation/wave of electrical disturbance that travels through the nerves to the brain.
 - (iii) **Response:** It is the activity our body shows in response to a stimulus.
 - Nervous tissues –Highly specialised tissues present in the brain, spinal cord, and nerves.
 - Neuron – It is the functional unit of nervous tissue
 - A neuron consists of a cell body, an axon, and a dendrite.

- Cells of the nervous tissues are highly specialized for becoming stimulated and then transmitting the stimulus very rapidly from one place to another within the body.
- Neurons are responsible for both collecting and delivering messages in our body.

Neurons

The fundamental unit of the nervous system is the nerve cell.

Parts of neurons:

- **Dendrite:** It receives information from the axon of an adjacent neuron and conducts it toward the cell body.
- **Axon:** It conducts messages away from the cell body.
- **Cell body:** It contains a nucleus, mitochondria and other organelles. It is concerned with the maintenance and growth of the cell.

Fat containing Schwann cells help in insulating the neurons making them capable of transmitting signals very fast.

The myelin sheath is not continuous over the axon and has some gaps exposing the axon. A gap between two adjacent myelin sheaths is called node of Ranvier.

Transfer of a Nerve Impulse from one to another nerve cell

The axon endings of one nerve cell are loosely placed on the cell body or cyton of another nerve cell, thereby forming a loose connection called synapse. Electric signals are transmitted from one neuron to the next across such synapses through the release of chemicals called neurotransmitters.

A released neurotransmitter crosses a synapse and starts a similar electrical impulse in the dendrite of the adjacent neuron. In this way, impulses are transmitted from one neuron to another and, ultimately, to the brain.

Glial Cells- nervous tissue also contains supportive cells of various kinds which do not help in conduction. These cells are called glial or neuroglial cells

Nerves:

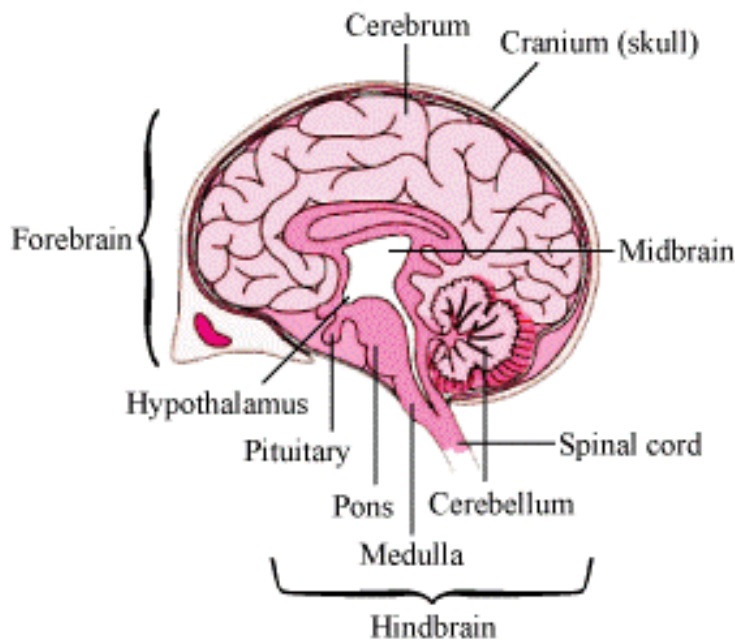
They are formed of a bundle of axons that are enclosed in a sheath.
They are of three types: sensory, motor and mixed.

Parts of the nervous system

- Human nervous system divided into- central nervous system (CNS) and peripheral nervous system (PNS)
- CNS consists of the brain and spinal cord
- PNS consists of the nerves that connects the CNS to different parts of the body
- The Brain, spinal cord, and nerves are the important parts of the nervous system

Brain

- The brain is enclosed in a bony box called the **cranium** and spinal cord is protected by **vertebral column**.
- The brain and spinal cord are externally covered by protective covering called **meninges**.
- It is made up of three layers namely **duramater (outer layer)**, **arachnoid (middle layer)**, **piamater (inner layer)**.
- The space between meninges is filled by a watery fluid called **cerebro- spinal fluid (CSF)**.



Human brain is classified into- forebrain, midbrain, and hindbrain.

- **Forebrain**- It consists of cerebrum, thalamus, and hypothalamus.
- It has following functions:
 - It is the thinking part of the brain.

- The forebrain has sensory regions that receive sensory impulses from various receptors.
- It has motor regions that control the movement of various muscles (such as the leg muscles).
- Cerebrum controls intelligence, learning, memory, thinking, and speech.
- Hypothalamus contains many areas that control things such as body temperature, urge for eating and drinking, etc.
- **Midbrain-** It is mainly concerned with the sense of sight and hearing.
- **Hindbrain-** It consists of pons, medulla, and cerebellum.
- It has following functions:
 - Most of the involuntary actions such as heartbeat, blood pressure, movement of food in the alimentary canal, salivation, etc., are controlled by the midbrain and medulla of the hindbrain.
 - Cerebellum is responsible for voluntary actions and maintaining the posture and equilibrium of the body.

Spinal Cord

- It is the continuation of the medulla oblongata and runs through the vertebral column.
- The spinal cord is made up of two similar halves fused together to form a central canal containing the cerebrospinal fluid.
- The outer portion of the spinal cord is known as the **white matter**, which consists of nerve fibres.
- The inner portion contains the cell bodies of neurons and is known as the **grey matter**.