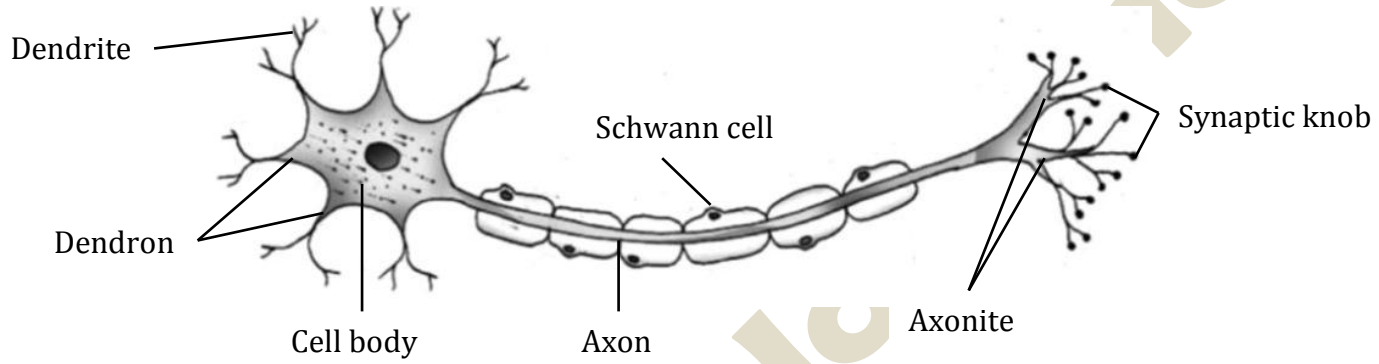
1. Sensations and responses

The nervous system helps to coordinate and regulate life activities with respect to external and internal changes (stimulus).

Human nervous system

Human nervous system includes **receptors** which receive stimulus and generates impulses, **nerves** – carries impulses and **brain and spinal cord** – they control and coordinate life activities according to impulses.

Neuron – basic unit



Part	Peculiarity	Function
Dendrite	Branches of dendron	♣ Receives impulses from adjacent neuron
Dendron	Short filaments from the cell body	♣ Carries impulses from dendrite to cell body
Cell body	Contains nucleus	♣ Controls neuron
Axon	Lengthy filament from cell body	♣ Carries impulses from cell body to outside
Axonite	Branches of axon	♣ Carries impulses to synaptic knob
Synaptic knob	Tip of axonite	♣ Secretes neurotransmitter to transfer electric impulse as chemical impulse to the adjacent neuron (Eg:- Acetyl choline, dopamine)
Myelin sheath	• Most neurons are repeatedly encircled by Schwann cells to form myelin sheath. • In the brain and spinal cord, myelin sheath formed by oligodendrocytes.	♣ Provide O_2 and nutrients to axon ♣ Accelerates impulses ♣ Act as an electric insulator ♣ Protect the axon from external shocks
	M**yelin sheath have a shiny white colour** ⇨ Myelinated nerves are seen in abundance in brain and spinal cord – **White matter** ⇨ Non myelinated nerves are present in abundance – **Grey matter**	

Nerves – Groups of axons covered by connective tissue -3 types

1. Sensory nerve – Carries impulses from various sense organs to the brain and spinal cord.

2. Motor nerve - Carries impulses from brain and spinal cord to the different parts of the body.

3. Mixed nerve - Carries impulses to and from the brain and spinal cord.

Impulses (Nerve messages)

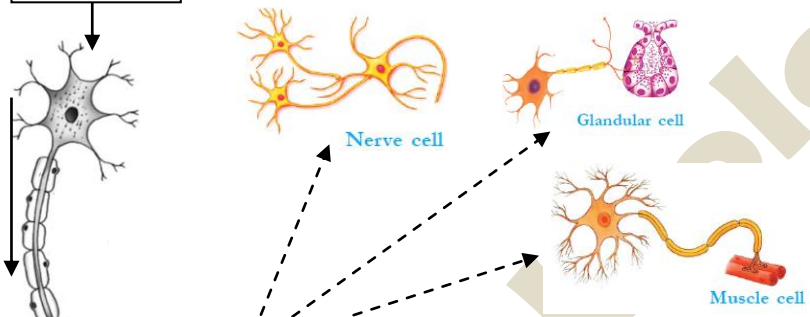
Nervous system controls and coordinates the activities by the help of impulses. The five sense organs receives external stimuli like **touch, temperature, cold, pain, pressure, sound, sight, smell** and internal stimuli like **hunger, thirst, head ache** and generates impulses and transferred to the brain through plenty of neurons. The brain analyses the impulses and generate correct responses.

Transfer of impulses

Receptors – Neurons have the ability to receive external and internal stimuli

Stimulus – The change in the distribution of ions in the both sides of cell membrane of neurns due to the internal and external changes.

Impulses – Transferring of electric charges due to change in the equilibrium



Synapse – Junction between two neurons or a neuron and a glandular cell or a neuron and a muscle cell.

♣ Helps to regulate speed and direction of impulses

Neurotransmitters secreted into the synaptic cleft, stimulates the adjacent neuron and new electric impulses are formed.

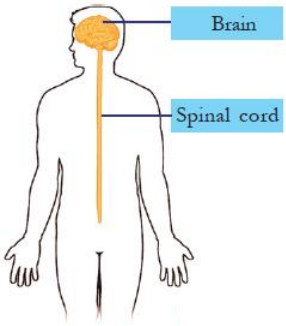
Brain

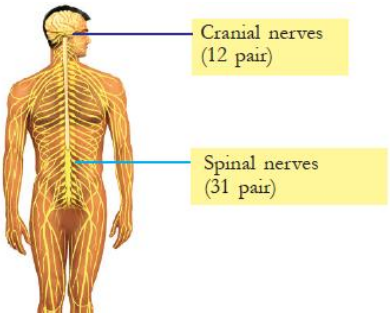
Responses – Changes according to the impulses

Human nervous system

Our nervous system is divided into two, **Central nervous system** and **peripheral nervous system.**

Central nervous system

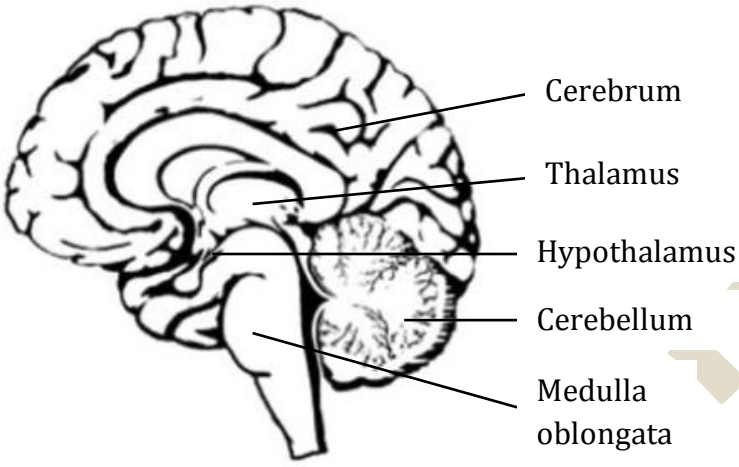




Peripheral nervous system

I. Central nervous system

A. Brain



Protections

♣ Skull – Hard bony covering

♣ Meninges – 3 layered membranes

♣ Cerebro spinal fluid (CSF) – Filled in membranes of meninges and ventricles of brain.

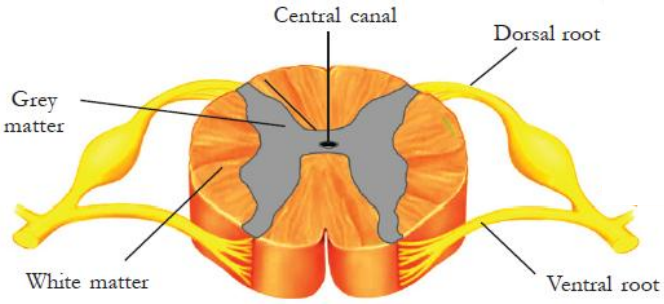
Functions :-

- Provide O_2 and nutrients to the tissues of brain
- Regulates pressure inside the brain
- Protect the brain from injuries

Part	Peculiarity	Function
Cerebrum	• Largest part • Numerous fissures and folds are seen (To include more neurons) • The outer cortex grey matter and inner medulla white matter	♣ Centre of thought, intelligence, memory, imagination ♣ Evokes sensations ♣ Controls voluntary movements
Cerebellum	•Second largest part • Seen behind the cerebrum as two flap • Fissures and grooves are seen	♣ Coordinates muscular activities and maintains body balance
Medulla oblongata	• Rod shaped, below the cerebrum and near cerebellum • Spinal cord is the continuation of medulla oblongata	♣ Controls involuntary actions
Thalamus	• Situated below the cerebrum	♣ Act as a relay station of impulses to and from the cerebrum ♣ Analyses the impulses from the body part and sends the important one to the cerebrum

Hypothalamus	• Situated just below the thalamus	♣ Helps to maintain homeostasis

B. Spinal cord



Spinal cord is a white (outer-white matter and inner-grey matter) tubular structure, which extends from medulla oblongata to the middle region of vertebral column.

Protection

♣ Vertebral column

♣ Covering of meninges

♣ CSF is filled in the membranes of meninges and central canal.

Function :-

- Coordinates rapid and repeated movements during running and walking.

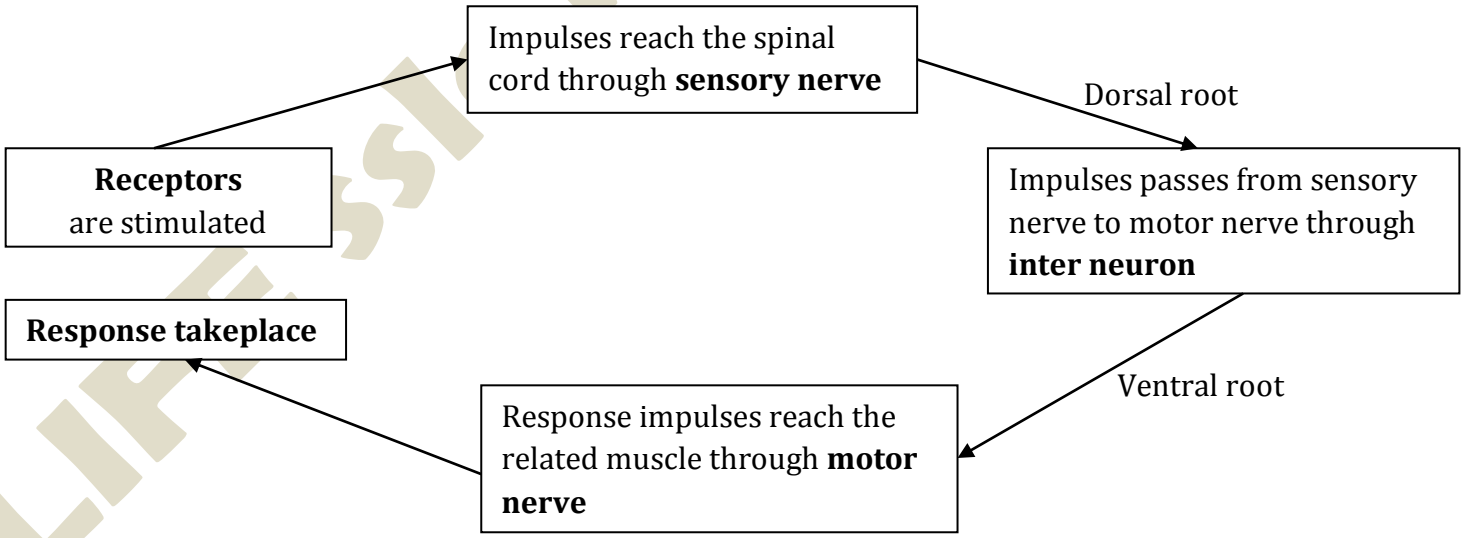
The majority of voluntary commands for the life activities are from the brain. But in emergency cases, the commands for the accidental and involuntary responses **(reflex action)** according to the stimuli are from the spinal cord – **Spinal reflex** (below the neck)**.**

After, the impulses reach the brain and then voluntary responses are controlled by brain.

Eg :- • Hand retract when we accidentally touch a hot surface

• Leg withdraw when we stepped upon a thorn

⇨ The pathway of impulses in the reflex action is called **reflex arc.**



Cerebral reflex – The reflex controlled by the brain (take place above the neck).

Eg :- • Blinking of eye when light suddenly falls on eye

• Rotating our head when insect comes towards eye

• Closing of ears with hands when we hear loud sound

II. Peripheral nervous system

Peripheral nervous system including 12 pair cranial nerves and 31 pair spinal nerves. It connects central nervous system with different organs of our body.

The autonomous nervous system, a part of peripheral nervous system controls the activities of different organs beyond the conscious level. The **sympathetic system** and **parasympathetic system** together form autonomous nervous system.

The sympathetic system helps to prepare for overcome the emergency situation. And parasympathetic system helps to regain all stimulated activities into normal.

Organ	Sympathetic system	Parasympathetic system
Eye	Pupil dilates	Pupil contracts
Salivary gland	Production of saliva decreases	Production of saliva increases
Trachea	Trachea expands	Trachea contracts
Heart	Heart beat increases	Heart beat becomes normal
Stomach	Gastric activities slow down	Gastric activities become normal
Liver	Glycogen is converted into glucose	Glucose is converted into glycogen
Intestine	Peristalsis slows down	Peristalsis becomes normal
Urinary bladder	It regains its normal state	Urinary bladder contracts

The sympathetic system includes the ganglion network on the both sides of vertebral column and related nerves. The nerves from brain and last ganglions from the spinal cord constitute parasympathetic system.

The disorders of nervous system

Disorder	Causes	Symptoms	Remedy
Alzheimer's	The neurons destroyed due to the accumulation of insoluble protein in the neural tissues	• Loss of memory • Inability to recognize friends and relatives • Inability to do routine works	No complete curing.
Parkinson's	Destruction of specialized ganglions in brain and production of dopamine reduced	• Loss of body balance • irregular movements of muscles • Shivering of the body • Profuse salivation	No complete curing. But can control by dopamine.
Epilepsy	Continuous and irregular flow of electric charges in the brain	• Epilepsy due to continuous muscular contraction • Frothy discharge from mouth • Clenching of teeth • Patient falls unconscious	Curing possible by medicines.