CHAPTER 1

SENSATIONS AND RESPONSES

Stimuli :

The senses that evoke responses in an organism are called stimuli

* Stimli are classified into two

1. Internal stimuli
2. External stimuli

Internal stimuli :

Stimuli from inside the body are called internal stimuli

eg: Hunger, thirst, pain, etc...

External stimuli :

Stimuli from outside the body are called external stimuli

eg: Burn, wounds adc.

Receptors :

These are specialized cells in the sense organs and other parts of the body to recieve stimuli. These cells are known as receptors.

Neuron :

Neuron or nerve cell is the basic structural unit of the nervous system.

Nervous system :

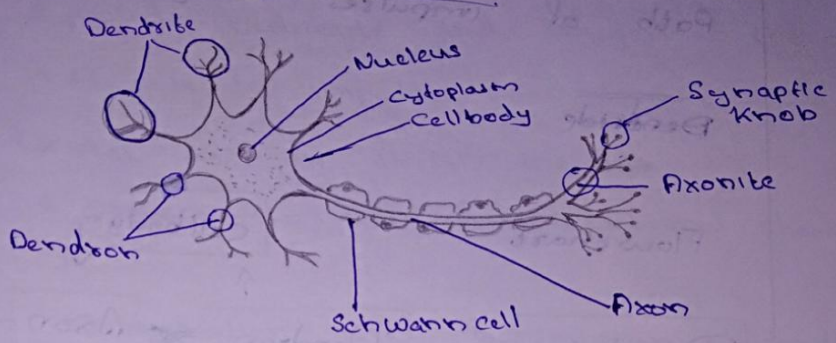
The nervous system controls and coordinates the actions of the body by receiving stimuli from different parts of the body.

* Nervous system is divided into two
1. Central Nervous system
2. Phericheral Nervous system.

* Central nervous system consist of Brain and Spinal Cord

* Phericheral nervous system consists of Cranial nerves and Spinal nerves

Neuron structure and parts



1. Dendride :
   - Branches of Dendron
   - part that recieves impulses from adjacent neuron

2. Dendron :
   - Short filament from the cell body
   - Carries impulses from dendrites to the cell body.

3. Schwann cell :
   - Encircles the axon

4. Axon :
   - Longest filamet from the cell body
   - Carries impulses from the cell body to outside

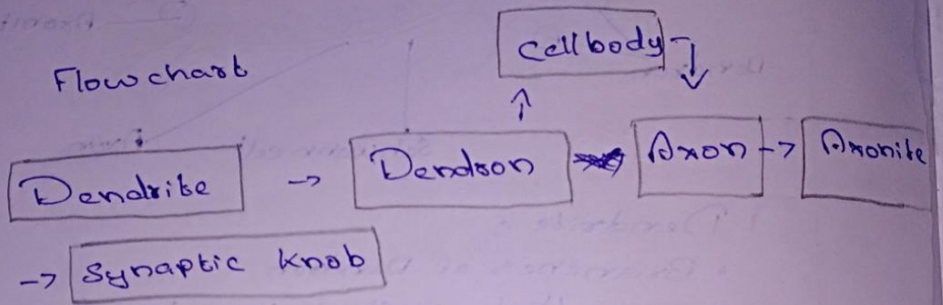
5. Axonite :
   - Branches of Axon
   - Carries impulses to the synaptic knob

6. Synaptic knob :
   - Tip of axonite
   - Secretes neurotransmitters.

Path of impulses through a Nerve cell

~~Dendrite~~

Flow chart



Myelin sheath :-

Axons of most of the neurons are repeatedly encircled by myelin, a membrane containing lipid. This is called mylin sheath.

* Myelin sheath in the nerves is formed of schwann cells.
* Myelin sheath in the Brain and the spinal cord is formed of specialized cells called Oligodentrocytes.

* The part of the brain where myelinated nerve cells are present in ~~ab~~ abundance is called White matter
* The part where non-myelinated nerves cells are present is called grey matter.

Functions of myelin sheath.

* provide nutrients and oxygen to the axon.
* Accelerate impulses.
* Act as an electric insulator
* protect the axon from external shocks.

Generation and Transmission of impulses

* The outer surface of the plasma membrane of the neuron is positively charged and inner surface is negatively charged.
* This is due to the difference in the distribution of certain ions
* when stimulated, the distribution of ions changes hence the inner surface became positively charged and outer surface become negatively charged
* This momentary charge difference stimulates it's adjacent parts and similar changes occur there too.
* As this process proceeds, impulses get transmitted as electric charges
* Nerve impulses are the messages transmitted through the neurons.

Synapse :

Synapse is the ~~function~~ junction between two neurons or a neuron and a muscle cell or a neuron and a glandular cell.

* When electric impulses reach the synaptic knob, certain chemical substances are secreted. From there to synaptic cleft these substances are called neurotransmitters.
* Acetylcholine and dopamine are examples of neurotransmitters.
* Neurotransmitters from the synaptic knob stimulate the adjacent dendrite ~~cell~~ or cell and new electric impulses are generated
* Synaps helps to regulate the speed and direction of impulses.

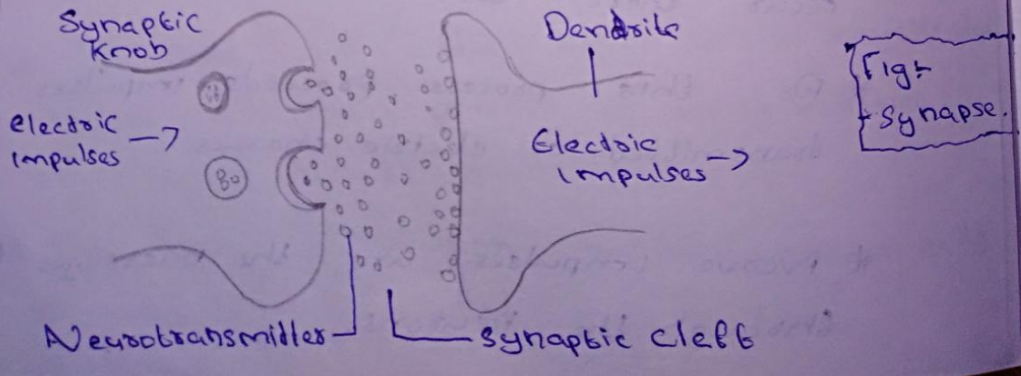


Fig: Synapse.

Different types of synapses:

* Nerve cell
* Muscle cell
* Glandular cell

Types of neurons

On the basis of the direction of impulse, neurons can be classified into three.

1) Sensory neurons 2) Motor neurons
3) Mixed neurons.

Sensory nerve :-

* Formed of sensory nerve fibres
* Carries impulses from various parts of the body to the brain and spinal cord

Motor nerve :-

* Formed of motor nerve fibres
* Carries impulses from brain and spinal cord to various parts of the body

Mixed nerve :-

* Formed of sensory nerve fibres and motor nerve fibres
* Carries impulses to and from the brain and spinal cord

Brain :

Brain is the central part of the nervous system.

Characteristics :

* The brain is protected inside the skull.
* It is covered by the menings, a three -layered membrane.
* The cerebrospinal fluid is filled within the inner membranes of meninges and the ventricles of the brain.

→ Function of Cerebrospinal fluid :

* provide nutrients and oxygen to the tissues of the brain
* Regulate the pressure inside the the brain to protect the brain from injuries.

Parts of Brain

Cerebrum :

- The largest part of brain
- numerous fissures and folds are seen
- The grey coloured outer part of cerebrum is called Cortex and the white coloured inner part is called Medulla

* Centre of thought, intelligence, memory and imagination.
- Evokes sensations.

- Controls Voluntary movements

Cerebellum :-

- The second largest part of brain
- Seen behind the cerebrum as two flaps.
- fissures and grooves are seen.
- Coordinates masculat activities and maint-ains equilibrium of the body

Thalamus :

- situated below the cerebrum
- Act as a relay station of impulses to and from the cerebrum.
- analyses impulses from various parts of the body and sends the important ones to cerebrum.

Medulla Oblongata :

* ~~The~~ rod shaped ~~end~~
* seen below cerebrum, located near the cerebellum.
- controls involuntary actions like heart beat breathing etc.

Hypo thalamus :

- situated just below the thalamus
- plays a major role in the maintanance of homeostasis.

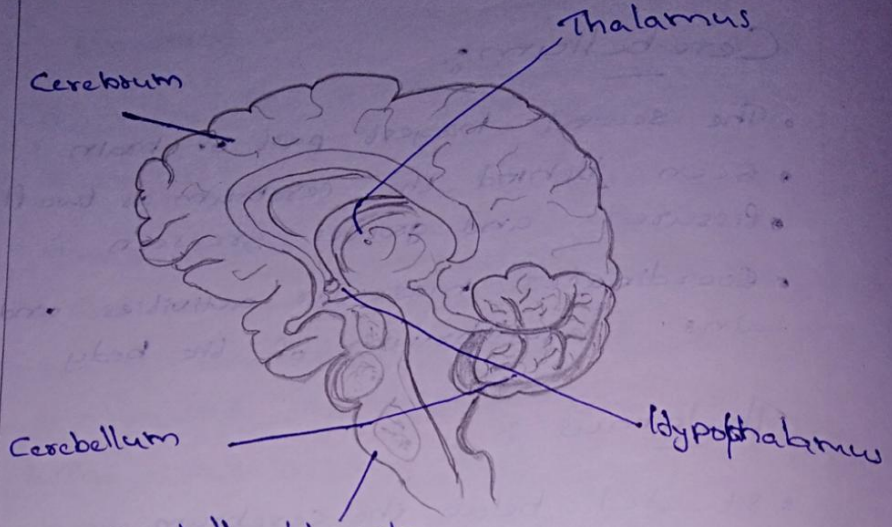


Fig: structure of brain

Spinal Cord

* The spinal cord is the continuation of the medulla oblongata.
* ~~The spina~~

peculiarities of spinal cord

* protected inside vertibral column.
* Covered by menings (like brain)
* Central canal can be seen in the centre of spinal cord.
* Central canal is filled with cerebrospinal fluid.
* White matter is seen outside and grey matter is seen inside.

* There are 31 pairs of spinal nerves arising from the spinal cord. A dorosal root and a ventaral root join to form a spinal nerve

* Sensory impulses reach the spinal cord through the dorosal root.

* Motor impulses go out of the spinal cord through the Ventral root.

* The impulses to and from the brain are transmitted through spinal cord

* It also coordinates the repeated movements during walking, running etc.

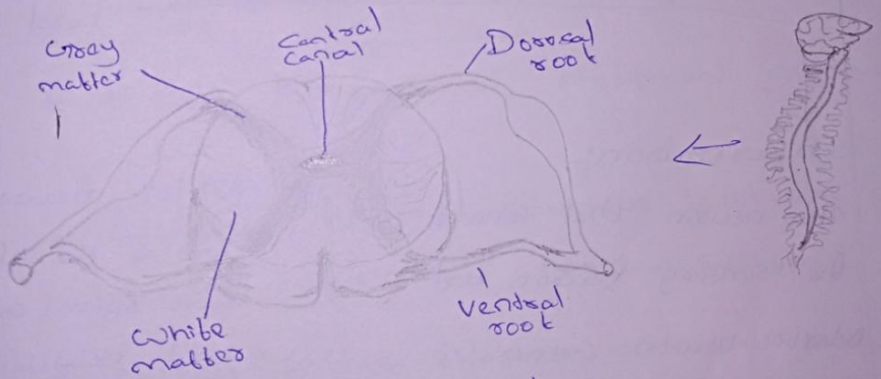


fig: Coss section of spinal cord

Functions of spinal cord:

* Transmitting impulses from different parts of body to and from the brain
* Coordinates the rapid and repeated movements during walking / running etc.
* Effects contain reflex actions

Reflex actions →

* Reflex actions are the accedental involuntary responses of the body in response to stimuli.
* There are two types of reflexes ; Cerebral reflexes and spinal reflexes.
* Reflex arc is the pathway of impulses in the reflex actions.

Flow chart of reflex arc —

Stimulus → Receptors: generate impulse → Sensory neuron: carries impulse to the spinal cord

Interneuron:-
The neuron that connects the sensory neuron and Motor neuron generates quick responses to related muscles according to sensory impulses.

→ Motor neuron:- carries the information from spinal cord to related muscles

↓

Related muscle: extract or contract according to the information from Spinal cord.

Cerebral reflexes :-

Reflexes which are under control of cerebrum

eg : We blink our eyes when light suddenly falls on our eyes.

Spinal reflexes :-

The reflexes which are under control of spinal cord.

eg. ~~We withdraws our hand~~

Bone of the knee is tapped, the knee is jerked

Autonomous Nervous System

* it is a part of pheripheral nervous system
* Activities beyond concious level are controlled by the Autonomous nervous system.
* The Sympathic system and the parasympa-thic system together form the autonomous nervous system.

organ/part	Action of Sympathetic System	Action of parasympathetic System.
Pupil	dilates	contracts
Salivary gland	decreases	Increases
Trachea	expand	Contracts
Heart	Heart beats increases	Heart beat becomes normal
stomach	Gastric activities slow dow	gastric activities become normal
Liver	Glycogen is converted into glucose	glucose is converted into glycogen.
Intestine.	peristalsis slow down.	peristalsis becomes normal
Urinary bladder	normal state	Contracts

Nervous disoders

Alzheimer's :-

Causes - Accumulation of an insoluble protein in the neural tissues of the brain. Neurons get destroyed.

~~Symptoms :- Loss of memory, inability to recog-~~
~~-nize muscles, shivering of the body,~~
~~profuse salivation.~~

Symptoms :- Loss of memory, inability to recognize friends and relatives, inability to do routine works.

Parkinsons :-

Cause :- Destruction of specialized ganglions in the brain. production of dopamine, a neurotransmitter in the brain gets reduced.

Symptoms :- Loss of ~~memory~~ body balance, irregular movement of muscles, shivering of the body, profuse salivation

Epilepsy

Cause :- continous and irregular flow of electric charges in the brain.

Symptoms :- ~~Epil~~ Epilepsy due to continous muscular contraction, frothy discharge from the mouth, clenching of the teeth flowing which the patient falls unconscious.