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NEURAL CONTROL AND COORDINATION

→ Coordination: is the process through which two or more Organ interact and Complement the function of each other.

→ Neural System provide an Organized network of point to point Connection for quick Coordination. The endocrine System provide chemical integration through hormone

NEURAL SYSTEM

• The neural System of all animal is Composed of Specialised Cells Called neurons which Can detect, receive and transmit different kind of Stimuli

→ In hydra neural System is Composed of network of neuron

→ In insect it Consist of brain and a number of ganglia.

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HUMAN NEURAL SYSTEM

The Central neural System [CNS]	The peripheral neural System [PNS]
→ Include brain and Spinal Cord	→ Comprises of all the nerves of the body associates with CNS.
→ Site of information processing and Control.	

- Peripheral neural System.

→ The nerve fibre of the PNS are of two types

1. Afferent fibres: Transmit impulse from tissues / Organs to the CNS.
2. Efferent fibres: Transmit regulatory impulse from the CNS to the Concerned peripheral tissue Organs.

→ The PNS is divide into two divison.

1. Somatic Neural System: Relays impulse from the CNS to Skeletal muscles.

2. Autonomic neural System: Transmit impulse from the CNS to the involuntary Organs and Smooth muscles of body.

→ The autonomic neural System is Classified into Sympathetic neural System and parasympathetic neural System.

NEURON

A neuron is a microscopic structure Composed by three major parts.

(i) Cell body (ii) Dendrites (iii) Axon

[i] The Cell body Contain Cytoplasm with Cell Organelles and Certain granular bodies Called Nissl's granules

[ii] Short fibre which branch repeatedly and project out of Cell body ~~is~~ also Contain Nissl's granuls are Called Dendrites

→ Transmit impulse towards the Cell body.

[iii] The axon is a long fibre, the distal end of which is branched.

- Synaptic knob: Each branch terminates as a bulb like structure called Synaptic knob.
  - ↳ Contain Synaptic Vesicles
    - ↳ Contain chemical [Neurotransmitters]

→ The axon transmit nerve impulse away from the cell body to a Synapse.

NEURONS

Multipolar	Bipolar	Unipolar
cell body		
→ ~~Neuron~~ With one axon and two or more dendrites	With one axon and one dendrite	With one axon only
eg: Found in Cerebral Cortex	found in retina of eye	Found in embryonic stage.

AXONS

Myelinated	Unmyelinated
→ Fibres are enveloped with Schwann cells to form myelin sheath around the axon.	Fibre is enclosed by Schwann cells that do not form myelin sheath around the axon.

- Nodes of Ranvier: The gaps b/w two adjacent myelin sheath.

→ Generation And Conduction Of Nerve Impulse

→ Different types of ion channels are present on neural membrane.

→ When a neuron is not Conducting impulse i.e resting, The axonal membrane is more permeable to K^+ and impermeable to Na^+.

→ The membrane is impermeable to negatively charged protein present in axoplasm.

→ The axoplasm inside the axon Contain high Concentration of K^+ and negatively charged protein and low Concentration of Na^+

→ The Fluid Outside the axon Contain high Concentration of Na^+ and Thus form a Concentration gradient.

→ Ionic gradient across the resting membrane is maintained by active transport of ion by Sodium - potassium pump.

→ This will develop positive charge outside the axonal membrane and negative charge on inner side. Therefore is polarised.

Resting potential : The electric potential across the resting membrane is called resting potential.

→ When stimulus is applied at site A, the membrane becomes permeable to Na^+ ions to make rapid influx of Na^+ ion to create outer surface negatively charged and inner membrane positively charged that create Action potential or Nerve impulse.

→ The nerve impulse from A moves to B in inner surface and B to A on outer surface.

→ This process is repeated several times to transmit the impulse.

TRANSMISSION OF IMPULSES

→ A nerve impulse is transmitted from one neuron to another through junction called Synapses.

→ A Synapses is formed by the membranes of a pre-Synaptic neuron and a post-Synaptic neuron, which may or may not be seprated by a gap called Synaptic cleft.

→ There are two type of Synapse.

[i] Electrical Synapses [ii] Chemical Synapses

[i] Electrical Synapses:

→ At electrical Synapses, the membrane of pre and post-Synaptic neuron are in Very close proximity.

→ Electrical Current Can flow directly from one neuron into the other across these Synaps

→ Impulse transmission across an electrical Synapses is always faster.

(ii) CHEMICAL SYNAPSES

→ The membrane of pre and post Synaptic neurons are separated by a fluid filled Space Called Synaptic cleft.

→ Chemical Called Neurotransmitter are involved in transmission of impulses at these Synapses.

→ When an impulse arrives at the axon terminal, it Stimulates the movement of Synaptic Vesicles towards the membrane where they fuse with plasma membrane and release their neurotransmitters in the Synaptic cleft.

→ The released neurotransmitters bind to their Specific receptors, present on post-Synaptic membrane

→ These binding opens ion channels allowing the entry of ion which can generate a new potential in the post-Synaptic neuron.

CENTRAL NEURAL SYSTEM

→ The brain is the Central information processing Organ of our body.

→ Act as the Command and Control System

→ The human brain is well protected by the Skull.

→ Inside the Skull, the brain is Covered by Cranial meninges Consisting of an Outer layer dura mater, a very thin middle layer arachnoid and an inner layer pia mater → Is in Contact with brain tissue.

→ Brain Can be divide 3 parts
1. Forebrain, midbrain and hindbrain.

1. FOREBRAIN

→ Consist of Cerebrum, thalamus and hypothalamus.

→ Cerebrum is divide into left and right Cerebrum hemisphere which are Covered by Cerebral Cortex.

→ The hemispheres are Connected by a tract of nerve fibre Corpus Callosum.

→ Cerebral Cortex Contains Sensory neuron motor neuron and association area.
↓
Control Complex function like memory and Communication.

→ Cerebrum wraps around a Structure Called Thalamus. It is major Coordinating Centre for Sensory and motor Signaling.

→ Hypothalamus lie at the base of thalamus
- Control body temprature, urge for Eating and drinking.
- Contain a group of neurosecretory cells, which Secrete hormone.

→ Limbic System is involved in Controlling Sexual behavior and expression of Emotional reaction.

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MIDBRAIN

→ located b/w ~~the~~ the thalamus/hypothalamus of forebrain and pons of hindbrain.

→ The dorsal portion of midbrain Consist mainly of four round Swelling Called Corpora quadrigemia.

HINDBRAIN

→ Consist of pons, medulla oblongata and Cerebellum.

Pons: ~~Consist~~ Consist of fibre tracts that interconnect different regions of the brain.

Medulla: Contain Centres which Control respiration, Cardiovascular ~~or~~ reflex.

REFLEX ACTION AND REFLEX ARC

→ Reflex action: is a Spontaneous autonomic mechanical response to a Stimulus without the will of Organism

→ Control by Spinal Cord.

→ The reflex pathway comprises at least one afferent neuron and ~~and~~ one efferent neuron.

→ Afferent neuron receive signals from a Sensory Organ and transmit the impulse Via, Dorsal nerve root into CNS.

→ Efferent nueron then carries signals from CNS to effector.

EYE

1. Parts of Eye

→ Spherical in structure

→ eye ball is composed of three layer.

1. Sclera: External layer, made up of dense Connective tissue. Anterior portion of this layer is called Cornea.
2. Choroid: Middle layer, Contain blood vessels and looks bluish in Colour.

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→ Choroid become thick in anterior part to form ciliary body.

→ Iris is visible coloured portion of eye.

→ A transparent Crystalline lense is held in place by ligament attached to ciliary body.

3. Retina: Inner layer, Contain three layer of cells – from inside to Outside ganglion Cells, bipolar cell and photoreceptor Cell.

→ There are two type of photoreceptor cell called rods and Cones

→ The daylight Vision and Colour Vision are function of Cones

→ The twilight Vision is function of rods.

MECHANISM of Vision: The light rays of visible wavelength fall on retina through Cornea and lense to generate impulse in rods and Cones.

→ Photosensitive pigment opsin and retinal get dissociated due to light to changes it's shape.

→ change in shape of opsin cause change of permeability to genrate action potential that is transmitted to brain via optic Nerve.

→ where the neural impulse are analysed and the image formed on retina is recognised.