

# YAKEEN NEET 2.0

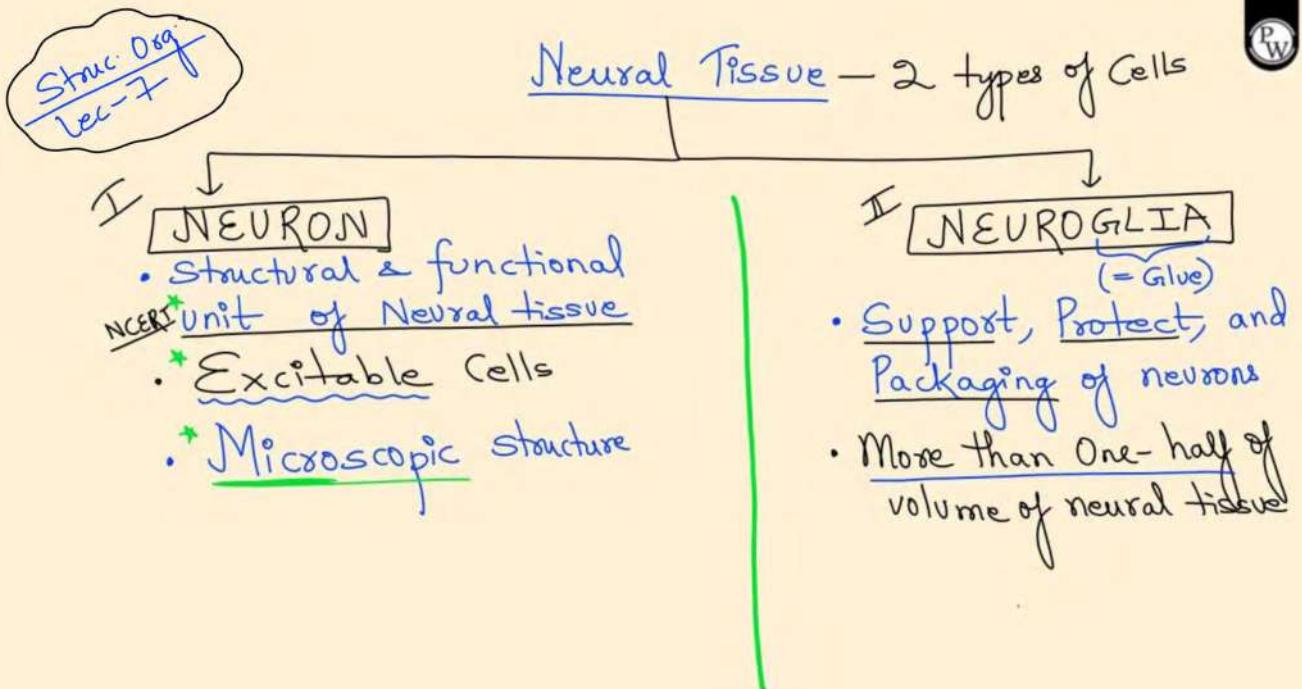
2026

Neural Control and Coordination

Zoology

Lecture - 01

By- Akanksha Ma'am



*Struct. Org  
lec-7 \**

Mycelin sheath: Phospholipid layers, Act as Insulator  
No Exchange of ions

\* NCERT  
Neural Control  
chapter

**NEURON** — 3 parts

I **DENDRITE**

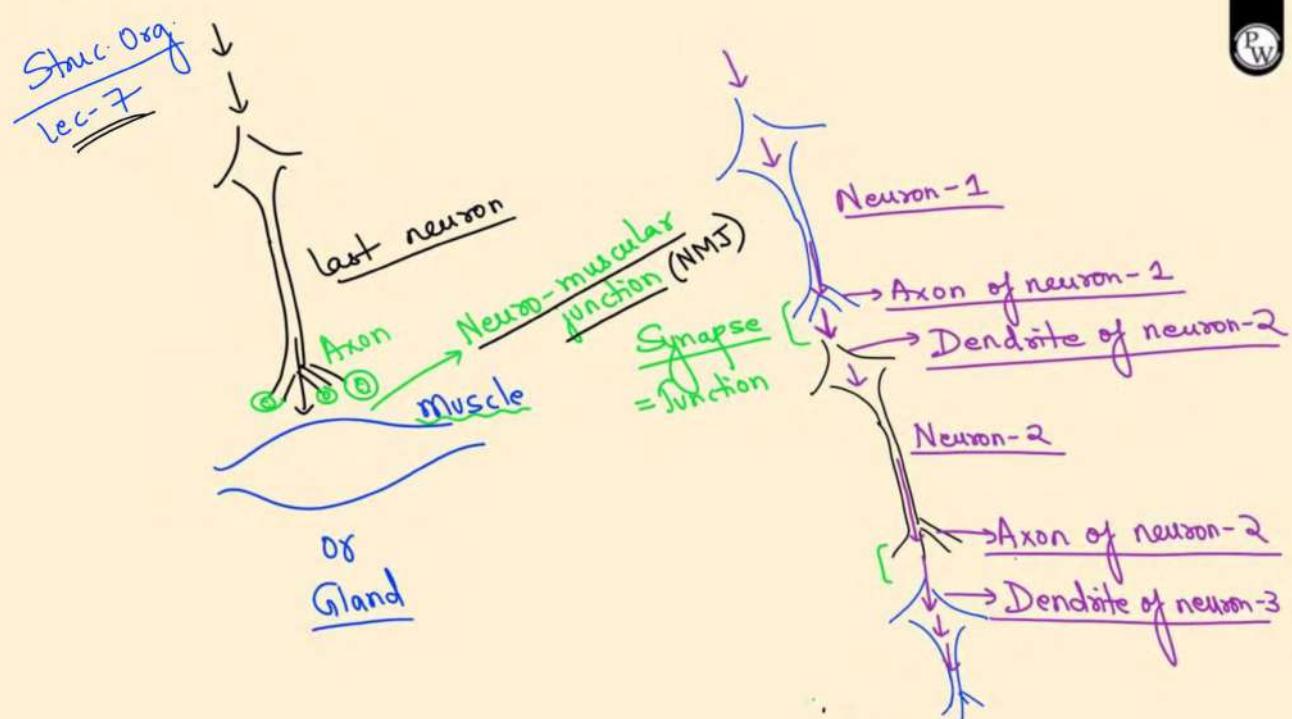
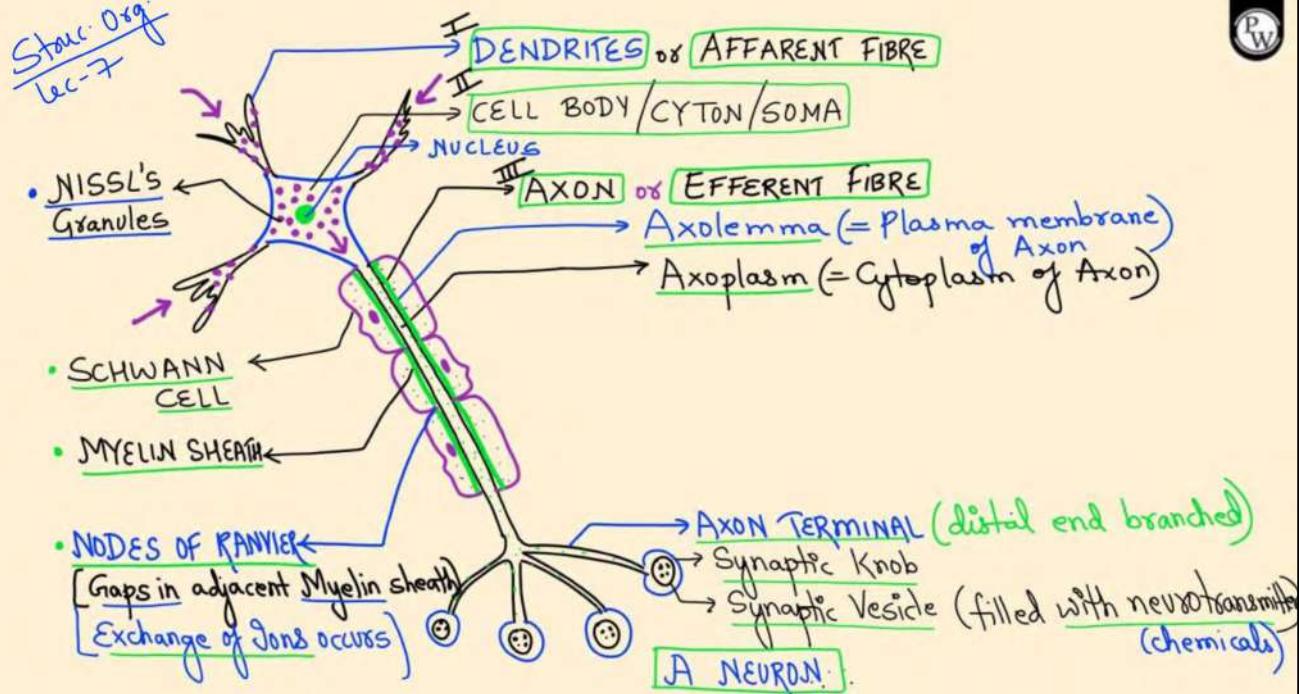
- Short fibres
- Branched repeatedly
- Transmit impulse towards Cell body
- Project out of cell body
- Nissl's granules present

II **CELL BODY**

- Contains Nucleus, Cytoplasm, other typical organelles
- Granular structure called "NISSI'S Granules"
  - \* made of RER + Ribosomes
  - \* Function: PROTEIN SYNTHESIS

III **AXON**

- long fibre
- distal end is branched
- Transmit impulse
- Away from cell body to Synapse or Neuro-muscular junction



### \* Neural Control & Coordination :-

Nervous System      Order Command

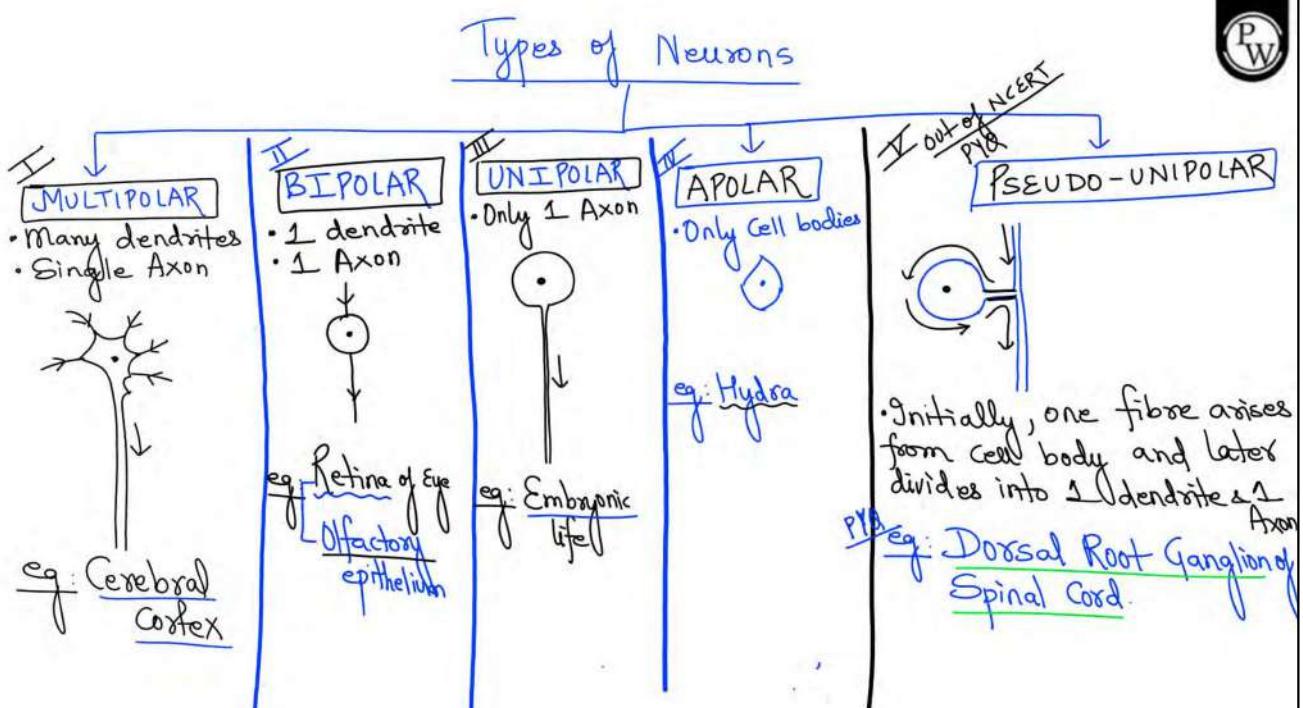
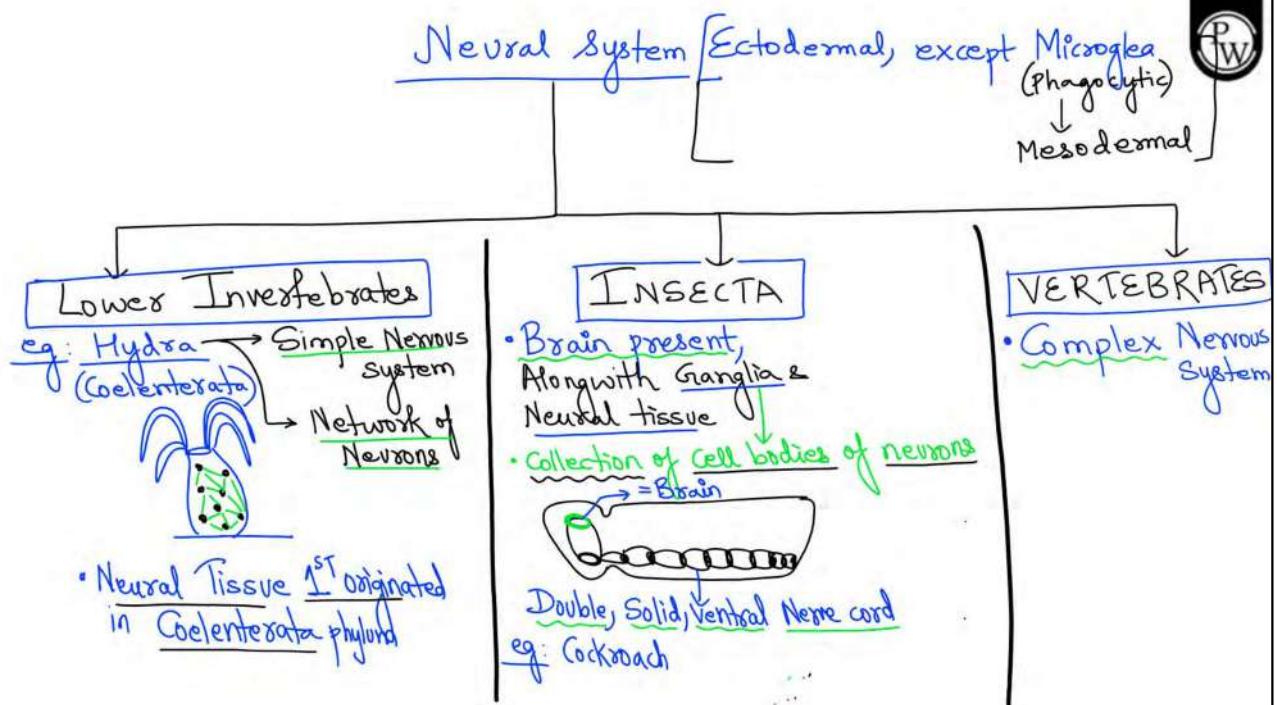
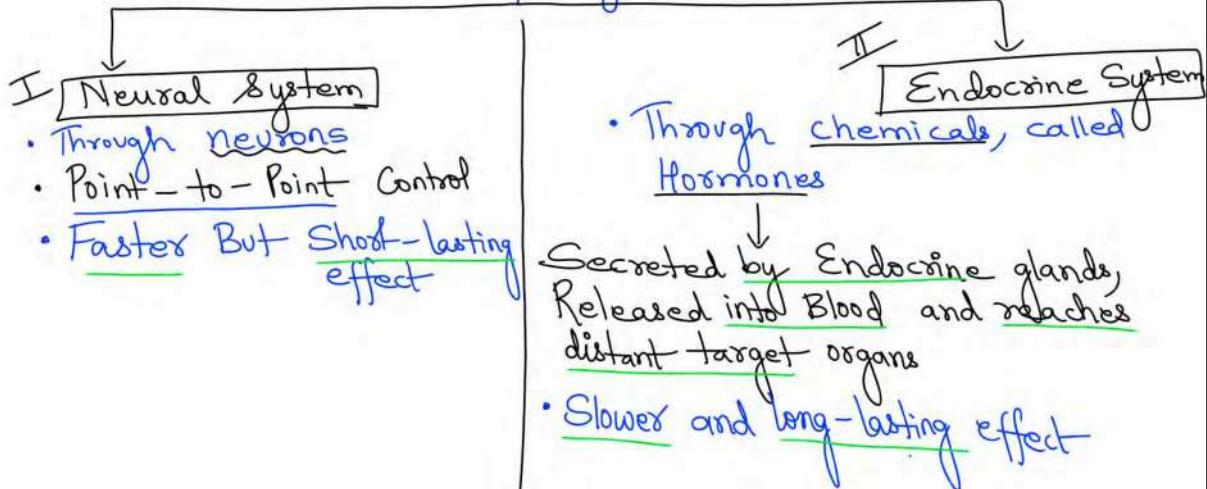
Process through which 2 or more organs interact and complement functions of each other, to maintain homeostasis (constant internal environment)

e.g.: During exercise, Energy demand ↑

1. Muscular activity ↑
2. More O<sub>2</sub> needed
3. Resp. Rate ↑
4. Heart Rate ↑, C.O ↑
5. Blood flow in vessels ↑
6. Kidney functions ↑

Muscles, Heart, lungs, Blood vessels, Kidneys coordinate

In human body, coordination occurs through in 2 systems Synchronised manner



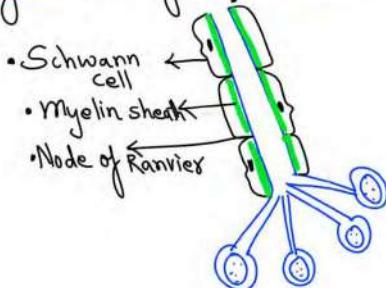
# Types of Neurons

P  
W

I

Myelinated / Medullated

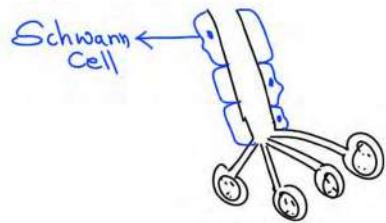
- Myelin sheath formed by (Phospholipid, Insulator)
- Schwann Cells in PNS
- Oligodendrocytes in CNS



II

Un-myelinated / Non-medullated

- Schwann cells present But do not Secrete Myelin sheath

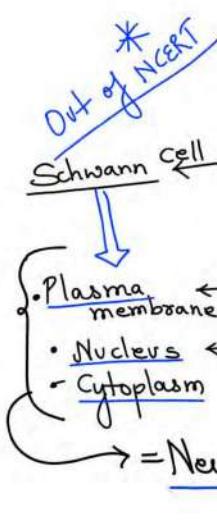


Character

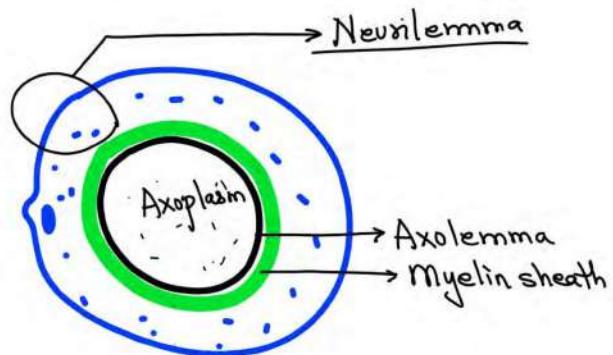
Myelinated MSC

Unmyelinated Neuron

✓ 1. Schwann Cell	⊕	⊕
✓ 2. Oligodendrocyte		
✓ 2. Myelin sheath	⊕	⊖
3. Node of Ranvier	⊕	⊖
4. Saltatory Jumping Conduction	⊕ 20 times faster conduction of nerve impulse	⊖
✓ 5. Occurrence	In <u>Cranial and Spinal Nerves</u>	In <u>Somatic &amp; Autonomic Nervous System</u>



NEURILEMMA = Sheath of Schwann cell

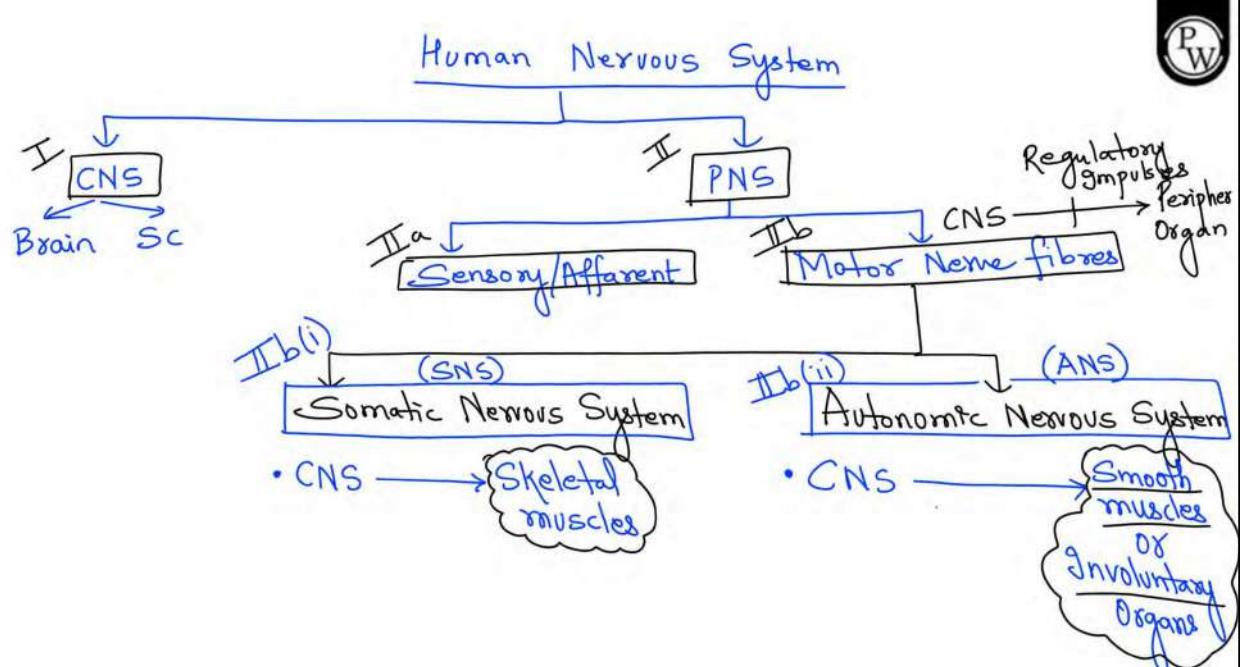
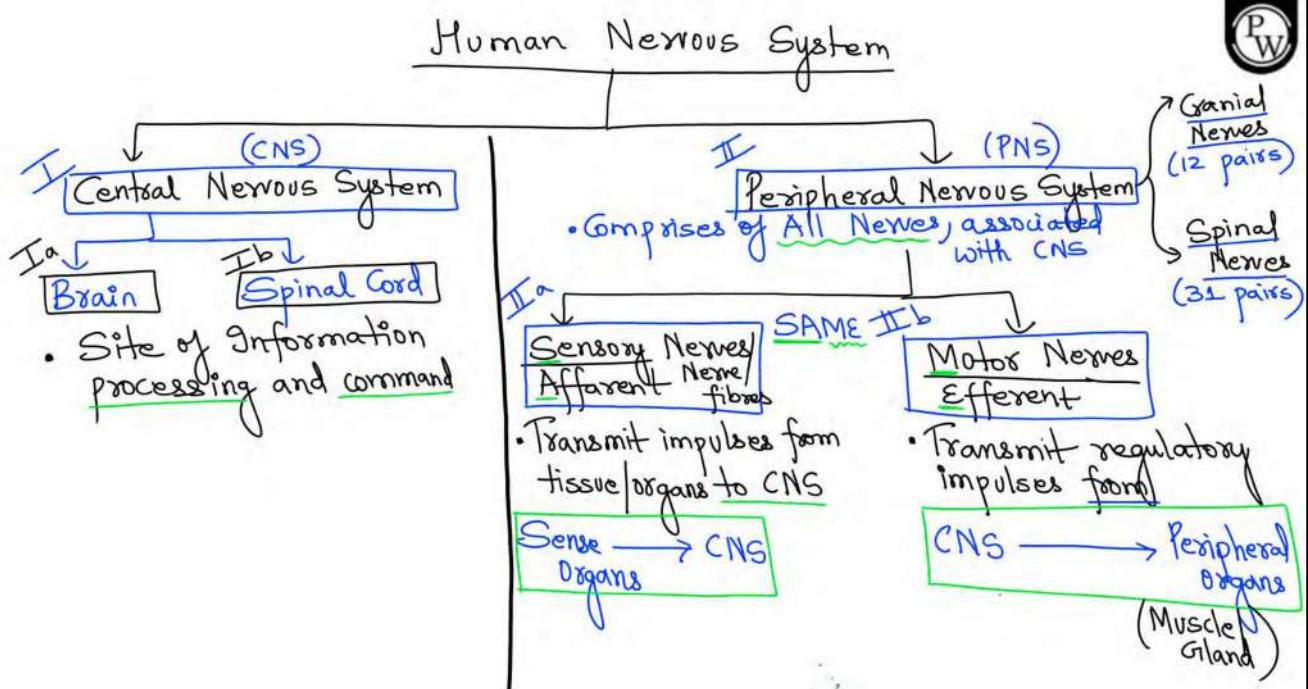


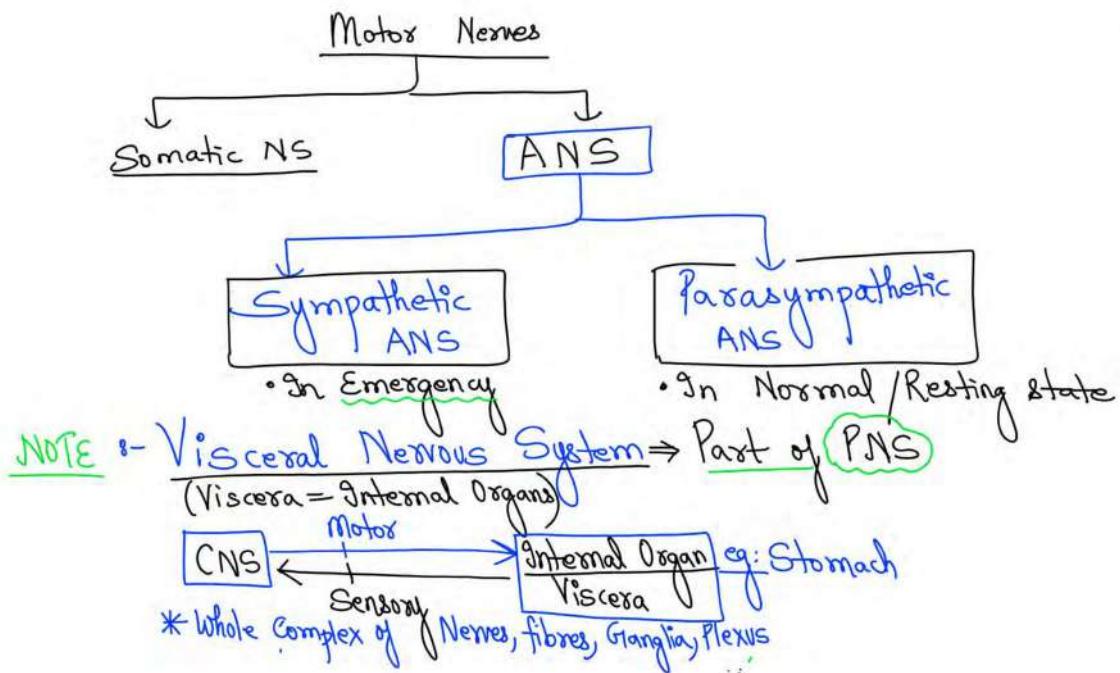
NOTE \* Plexus = Network (जाल)

P  
W

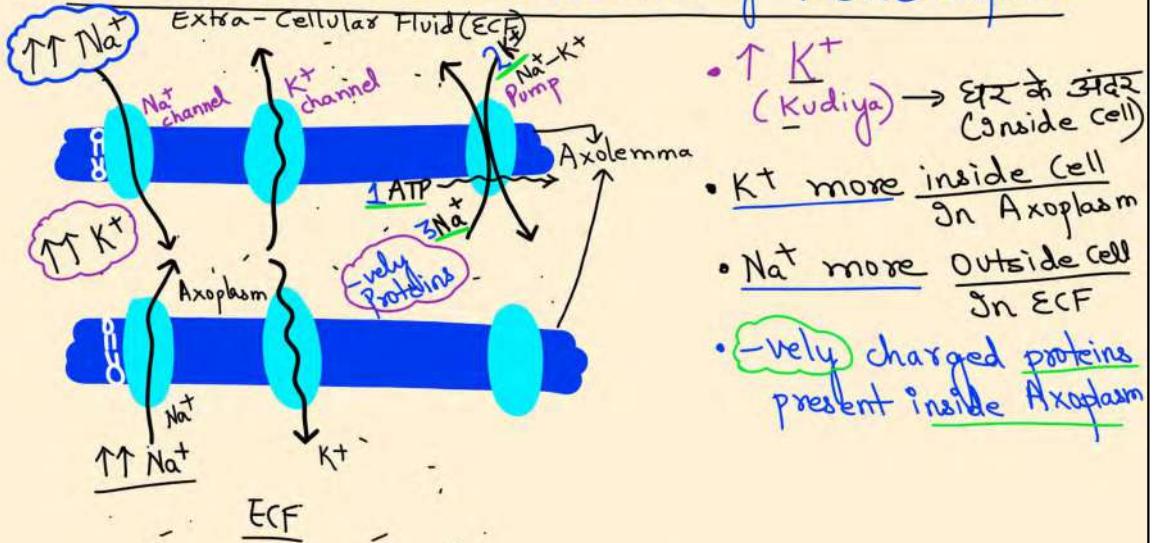
	CNS	PNS
1. Group of Cell bodies	Nuclei	Ganglia
2. Group of Axons	Tract	Nerve fibres

2

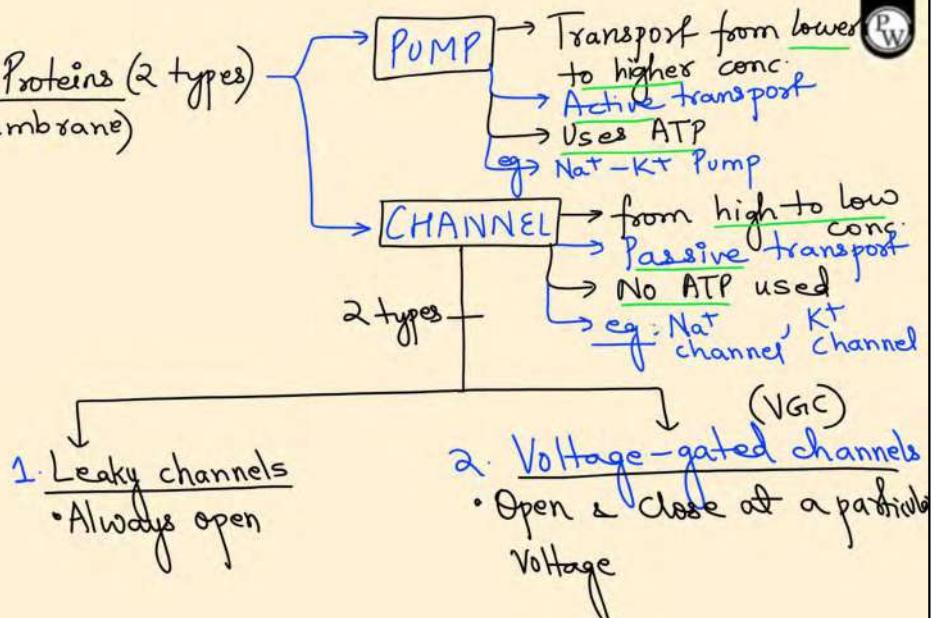




### \* Generation and Conduction of Nerve Impulse

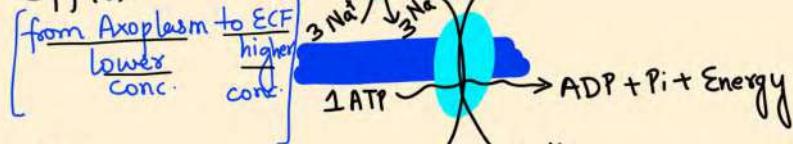


### \* Membrane Proteins (2 types) (Transmembrane)

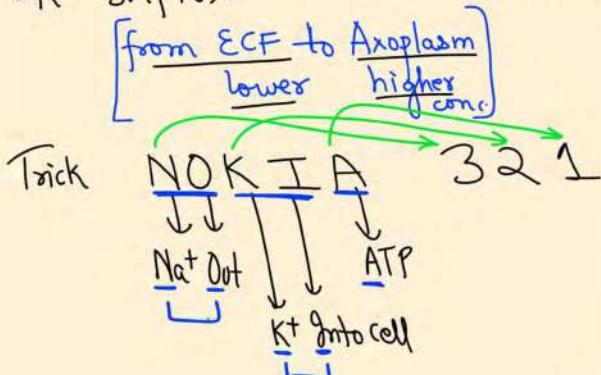


## \* $\text{Na}^+ - \text{K}^+$ Pump

- $\text{Na}^+$  efflux



- $\text{K}^+$  influx



•  $\text{Na}^+$  channel: Transport  $\text{Na}^+$  from higher to lower conc.  
ECF Axoplasm  
outside cell into cell

•  $\text{K}^+$  channel: Transport  $\text{K}^+$  from higher to lower conc.  
Axoplasm ECF  
inside cell outside cell

\* V G C

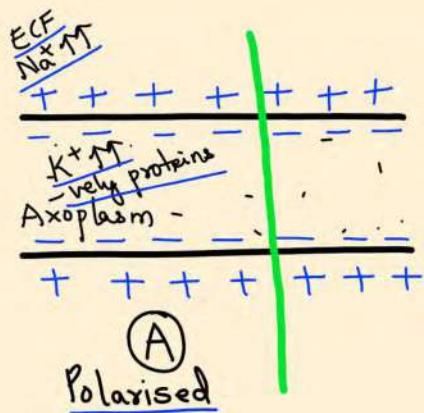
	Opens at	Closes at
1. $\text{Na}^+$ VGC	-55 mV	+30 mV
2. $\text{K}^+$ VGC	+30 mV	-90 mV

## \* STIMULUS

1. light — Eyes
2. Sound — Ears
3. Smell — Nose
4. Taste — Tongue
5. Touch — Skin

## I RESTING/POLARISED STAGE: Axolemma

→ Inside -ve  
→ Outside +ve



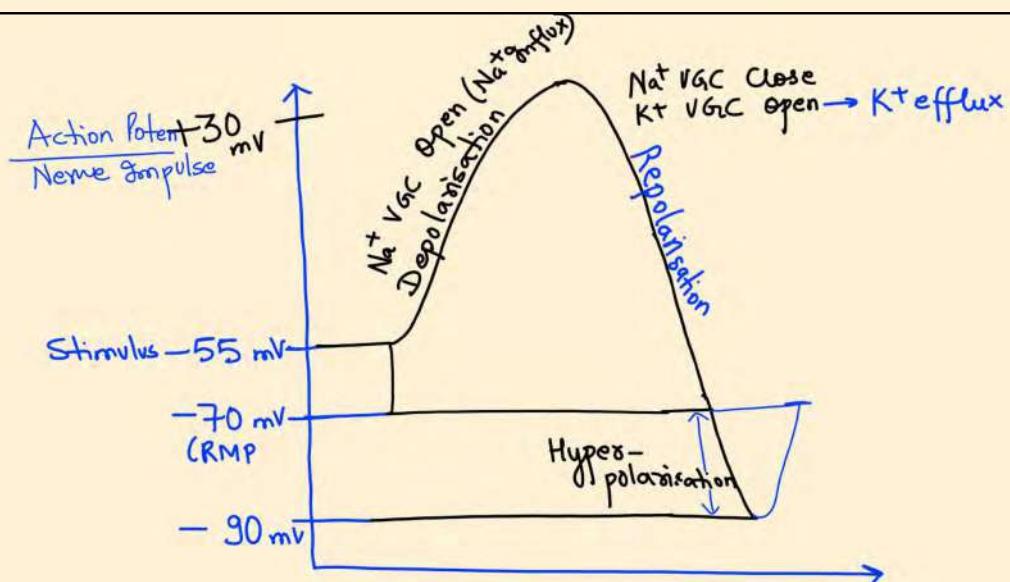
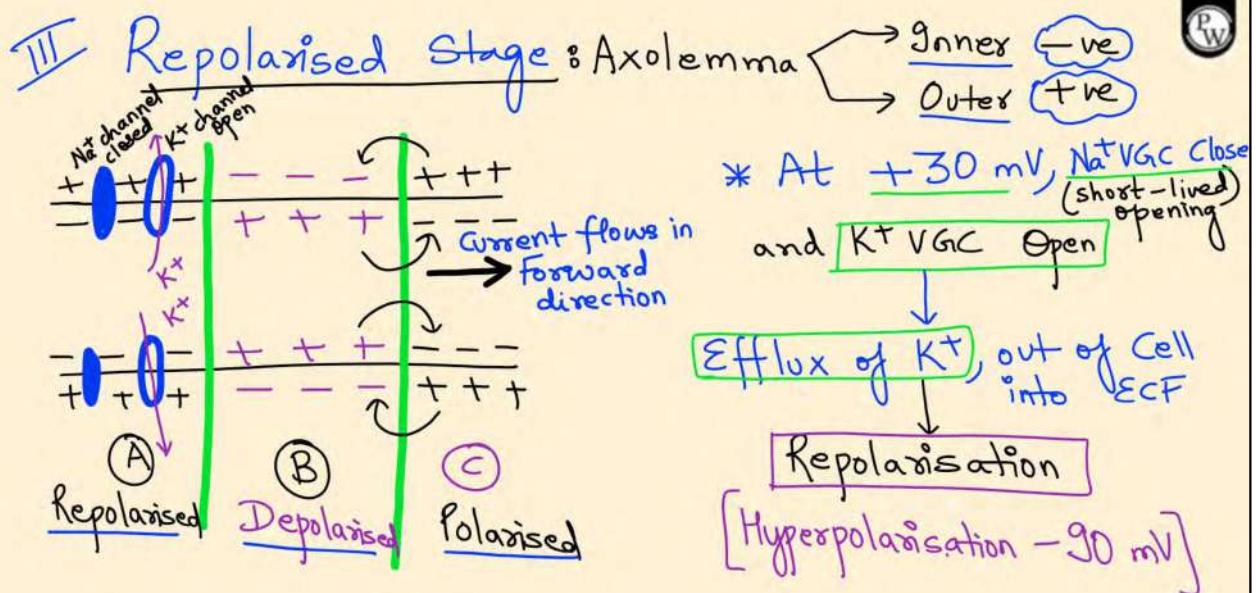
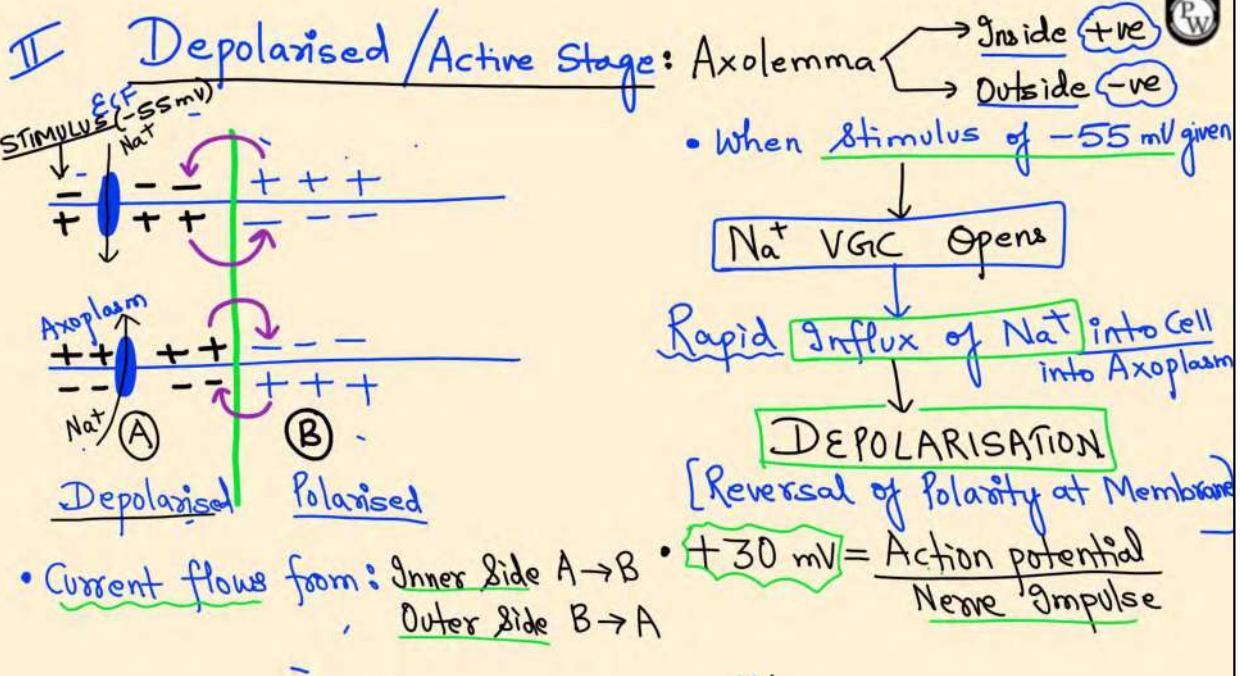
## \* Resting Membrane Potential (RMP)

$$\text{RMP} = -70 \text{ mV}$$

\* RMP created due to: Membrane is

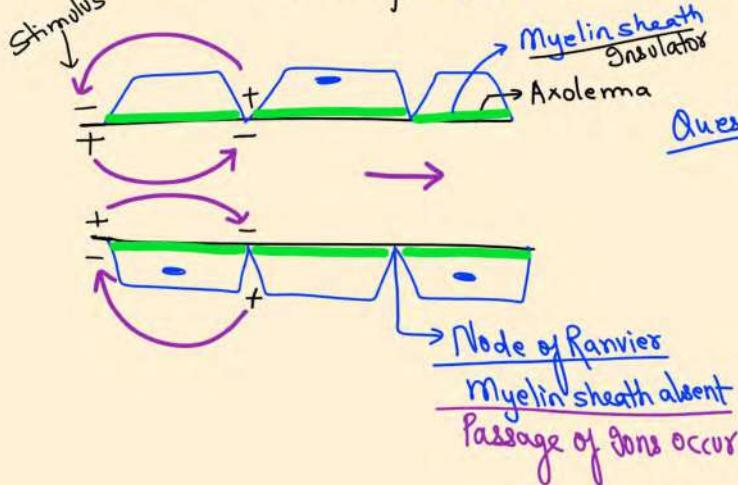
- a) almost Impenetrable to  $\text{Na}^+$  ions
- b) Slightly More Permeable to  $\text{K}^+$
- c) Impenetrable to - very proteins  
inside Axoplasm

\* RMP Maintained by: Sodium-Potassium Pump



## \* Saltatory Conduction In Myelinated Neurons

- 20 times faster Conduction of Impulse



Ques If Myelin sheath is Continuous / Uniform

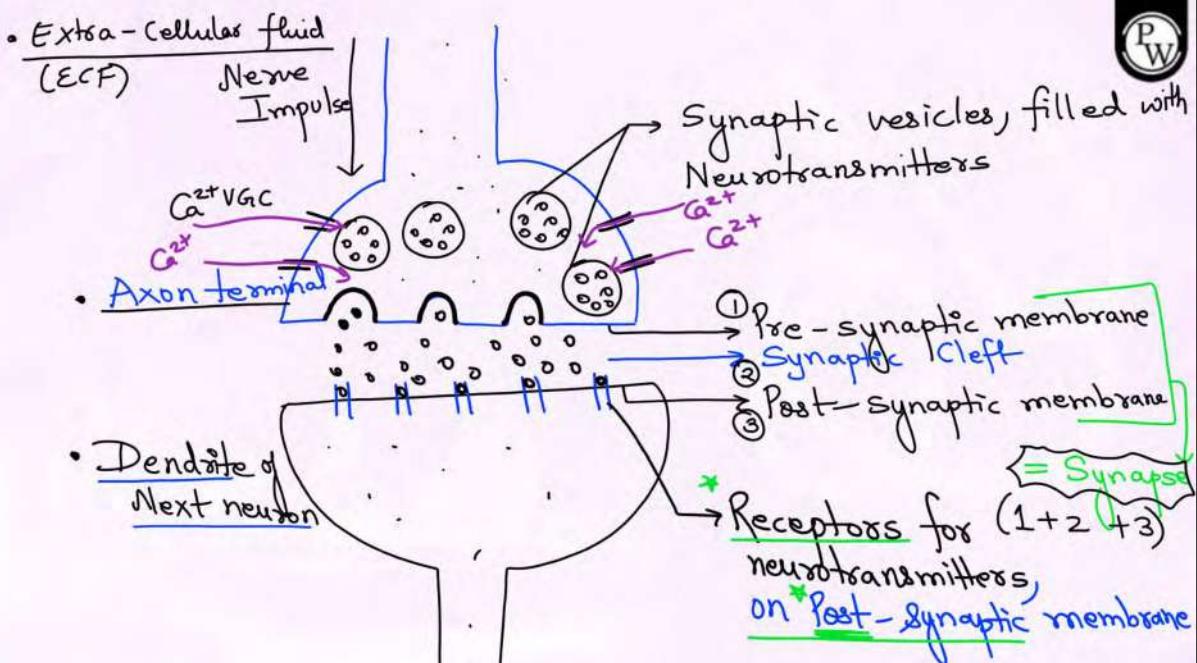
OR  
If Node of Ranvier absent

No Impulse Conduction

## \* Transmission of Nerve Impulse :-

Through Synapse

Nerve impulse conduction from one neuron to next neuron or from neuron to Muscle occurs through junctions called Gland Synapse.



# Types of Synapse - 2 types

P  
W

I

## ELECTRICAL — Bidirectional conduction

- Rare in our body
- Pre & Post-synaptic membranes are in close proximity
- Synaptic Cleft: Absent
- Electric current flows directly from one neuron to next, similar to conduction along a single axon.
- No role of neurotransmitter
- Faster conduction

## CHEMICAL SYNAPSE

- Most in our body
  - In between, Pre & Post-synaptic membrane, a fluid-filled cavity, "Synaptic cleft" is present
  - Role of neurotransmitter chem.
  - Slower Conduction
  - Unidirectional Conduction
- (AR) because receptors present ONLY on post-synaptic membrane

\* Wave of depolarisation reaches Axon terminal  
Nerve impulse

- $\text{Ca}^{2+}$  VGC opens and  $\text{Ca}^{2+}$  diffuses from ECF into Axoplasm (higher conc) (lower conc)
- $\text{Ca}^{2+}$  stimulates fusion of Synaptic vesicles with pre-synaptic membrane (Plasma membrane)
- Bursting of Synaptic vesicles
- Release of neurotransmitters, into Synaptic cleft, by Exocytosis
- Neurotransmitters Bind with Specific receptors, on Post-synaptic membrane

- ↓
- New potential developed, on Post-synaptic membrane, may be Excitatory or Inhibitory, depends on neurotransmitters

out of NCERT

### Excitatory Neurotransmitter

e.g. Acetylcholine (Ach)

\*  $\text{Na}^+$  VGC opens (on Post-synaptic membrane)

↓  
Rapid  $\text{Na}^+$  influx

↓  
Depolarisation (Action Potential)

### Inhibitory Neurotransmitter

e.g. Glycine, GABA (Gamma Amino Butyric Acid)

\*  $\text{Cl}^-$  VGC opens

↓  
 $\text{Cl}^-$  influx into Neuron, from ECF

↓  
Hyperpolarised (No Action Potential)

\* Synapse = formed by Pre and Post-synaptic membranes, May or May not be (chemical) separated by a gap, Synaptic cleft

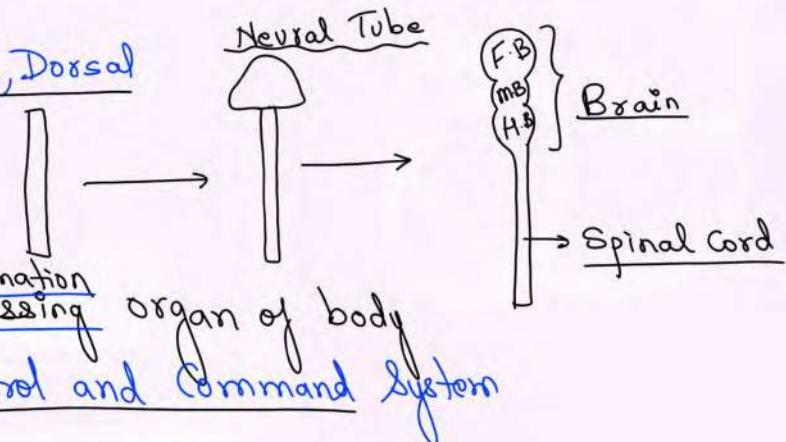
\* If receptors are removed from Post-synaptic membrane, in a chemical synapse, Then Conduction of Nerve Impulse STOPS

### \* Central Nervous System (CNS) :-

- Comprises Brain & Spinal Cord

#### \* BRAIN

- Single, Hollow, Dorsal Nerve Cord



- Central Information processing organ of body
- Acts as Control and Command system

- Controls Voluntary movements

- " Balance of body

- " Functioning of Internal organs (Kidneys, Lungs, Heart etc.)

- Thermoregulation

- Hunger

- Thirst

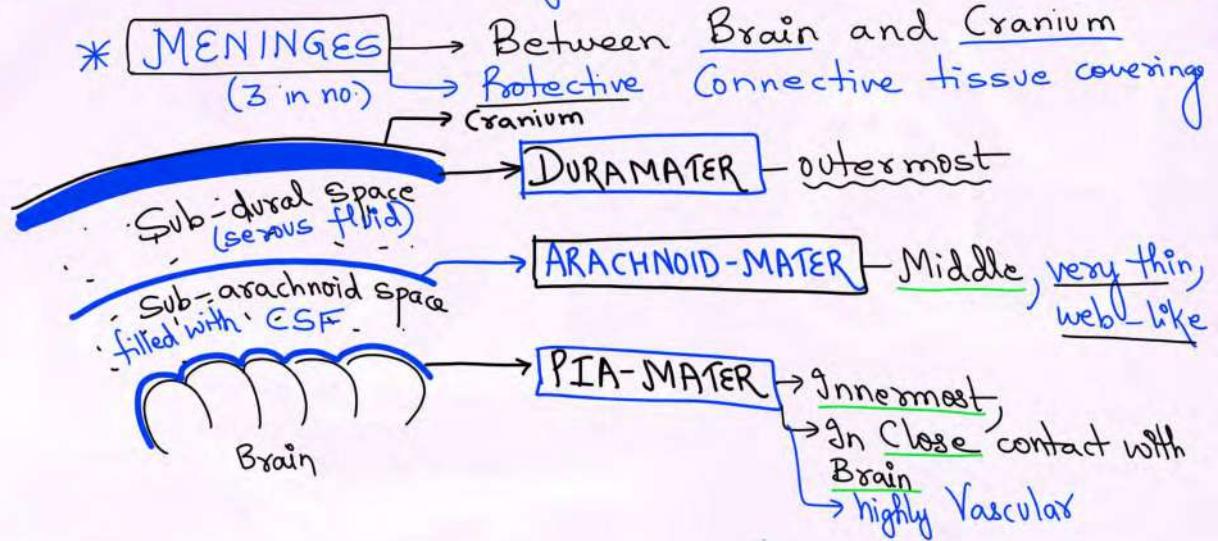
- 24 hour Circadian rhythm | Sleep - awake Cycle

- Processing of Hearing, Vision, Speech, Memory, Intelligence, Emotions, thoughts etc.

- Controls Human Behaviour

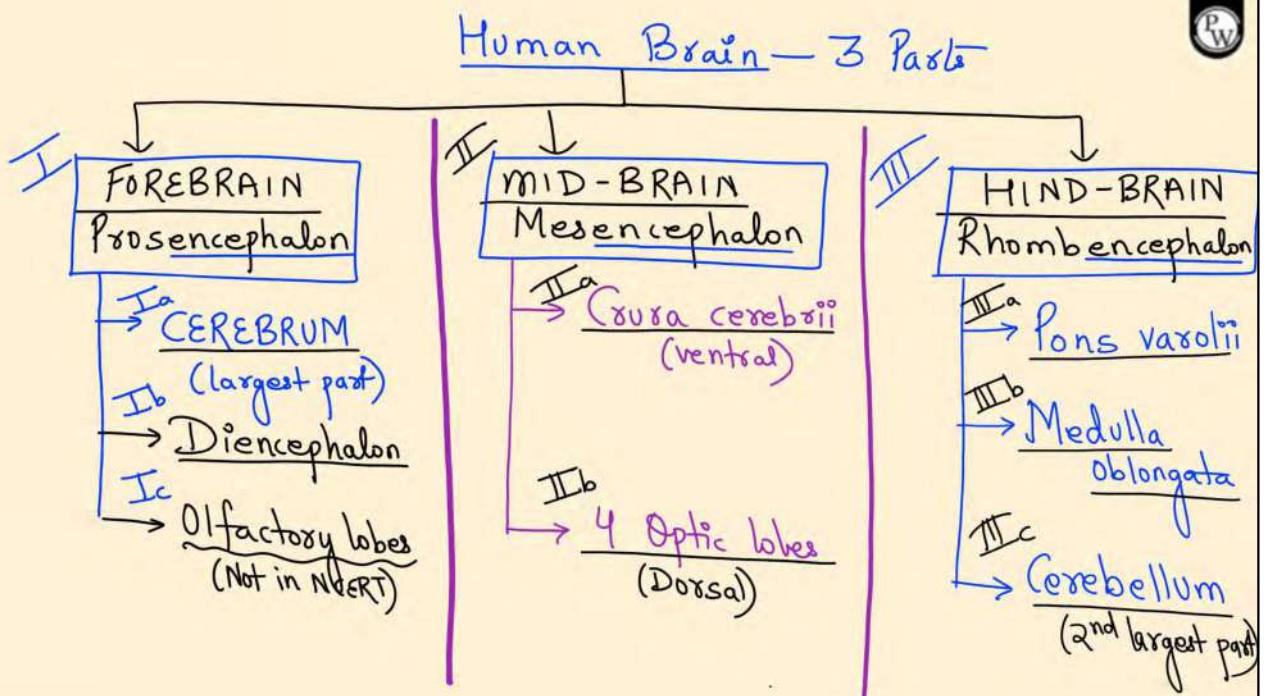
- Controls activities of several Endocrine glands

\* Human brain is well-protected by Skull (Cranium / Brain box)  
 (wt: 1.2 - 1.4 kg)



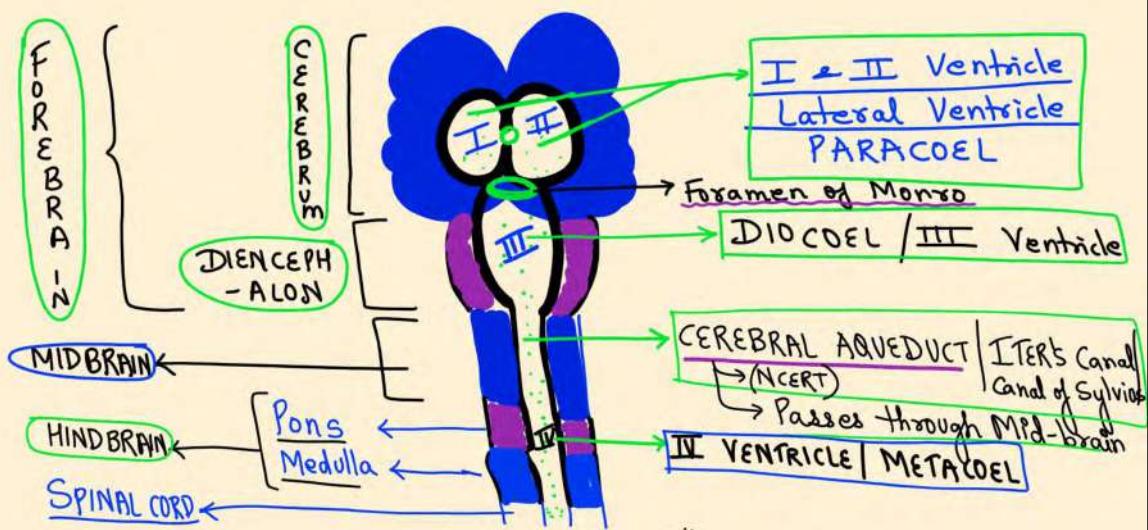
\* **CSF** = Cerebro-Spinal Fluid

- Supply O<sub>2</sub>, nutrients to Brain
- Remove Waste, CO<sub>2</sub> from Brain
- Provides Buoyancy to Brain (weight reduction)
- Act as shock absorber

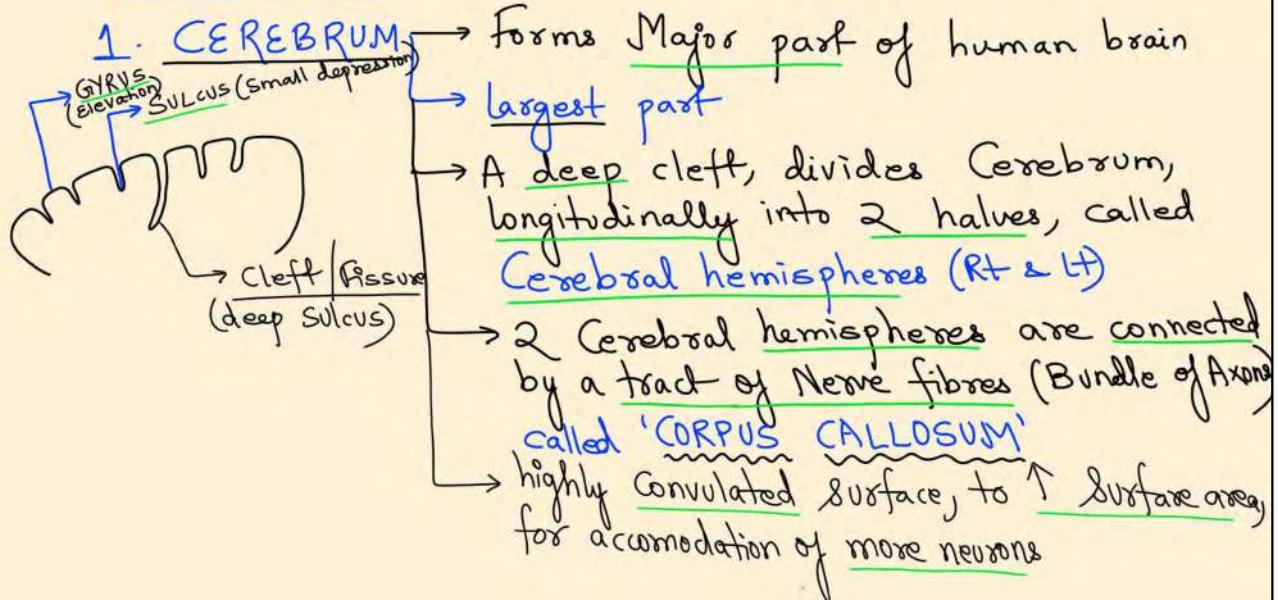


Out of NCERT

## Hollow Neural System, filled with CSF



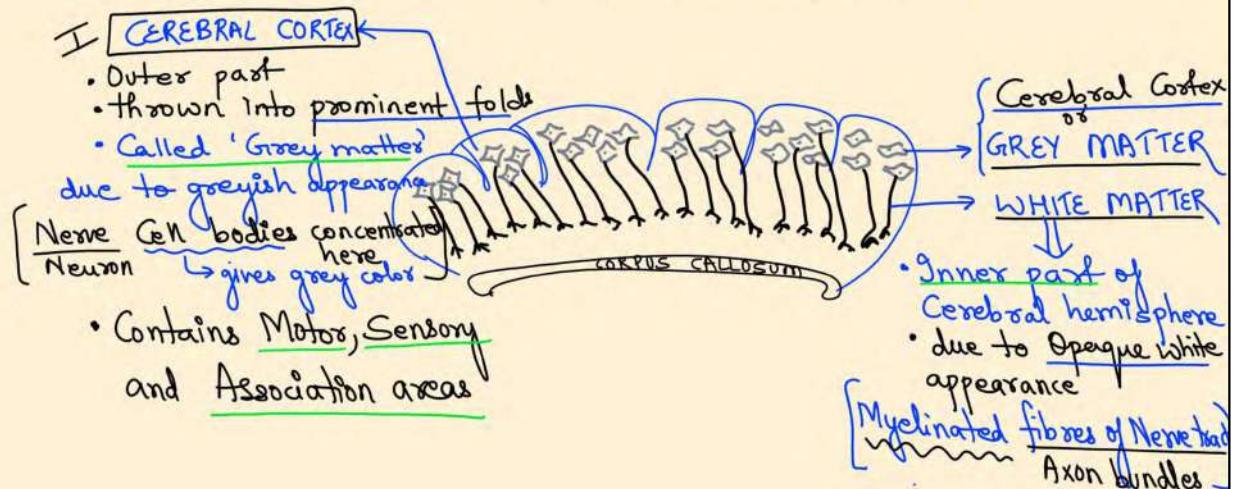
### \* FOREBRAIN



\* Cerebrum : 2 parts

2 Cerebral hemispheres

I Outer : Grey matter / Cerebral Cortex  
Inner : White matter



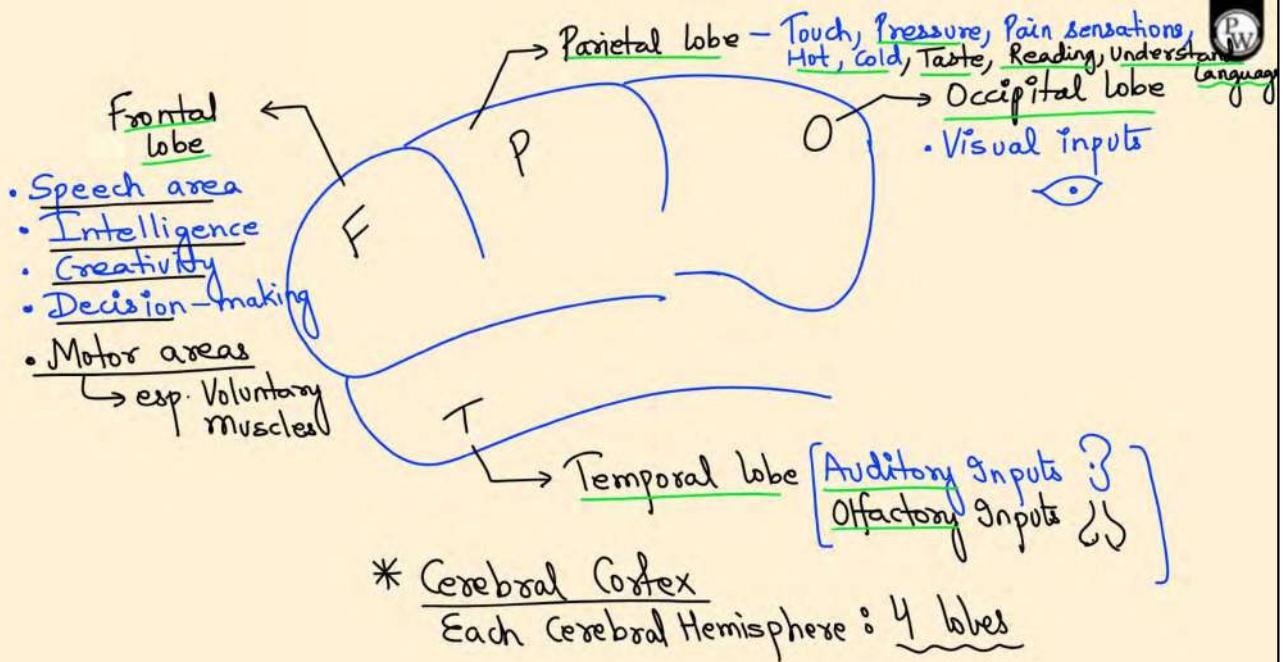
\* Association areas → Associated with Complex functions  
(large areas) like :

- M → Memory
- I → Inter-sensory association  
(multiple sensory info analysis)
- C → Communication

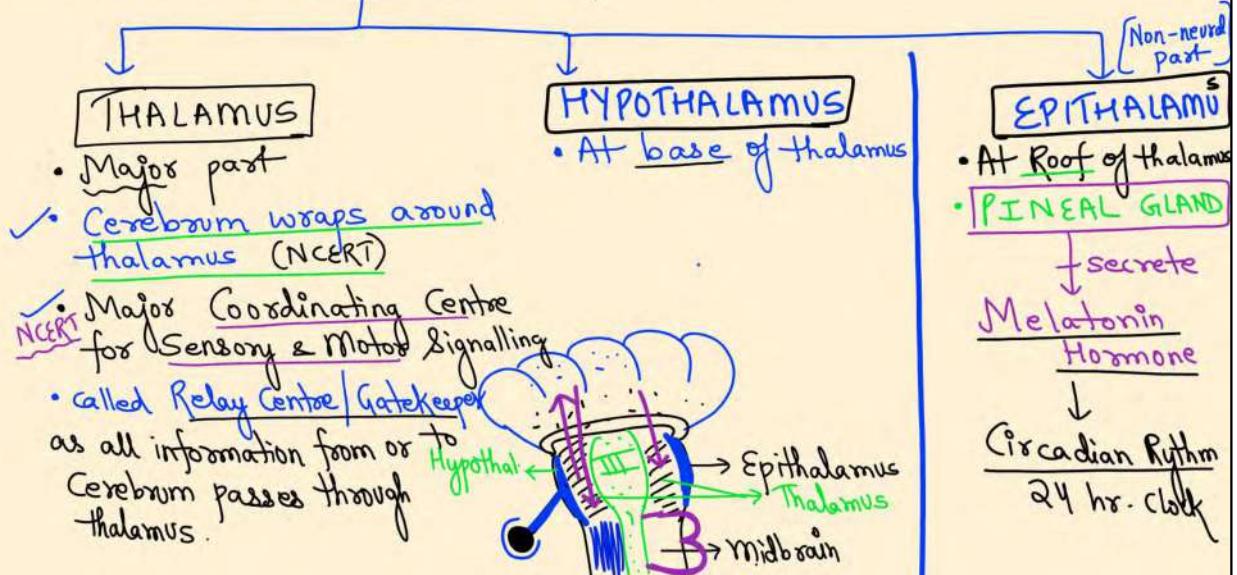
→ Neither Sensory, nor Motor

\* NOTE : In Brain, Grey matter Outer  
White matter Inner

In Spinal cord, Grey matter Inner  
(out of NCERT) White matter Outer



## 2. DIENCEPHALON : Part of Forebrain



\* HYPOTHALAMUS :- At base of thalamus

\* Thermostat of body

• Centres for Urge for Eating, drinking  
(Hunger / Thirst / Satiety Centres)

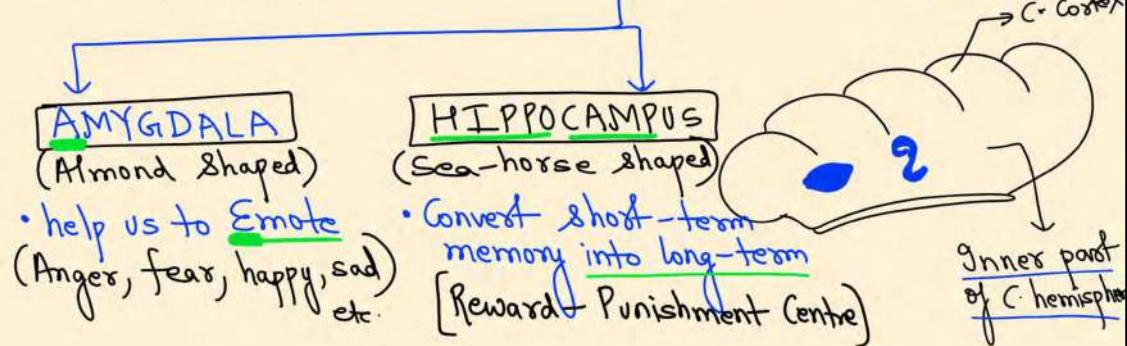
• Contain Neuro-secretory Cells → produce Hypothalamic Hormones

• Connects Neural and Endocrine System  
(Connected to Pituitary gland, by a Stalk-Infundibulum)

\* LIMBIC SYSTEM or Limbic Lobe

• In inner parts of Cerebral hemispheres

• a group of associated deep structures present



\* Limbic System  
alongwith Hypothalamus  
= Emotional Brain

1. Regulation of Sexual Behaviour

2. Expression of Emotional reactions (Anger, fear)  
(Sad, happy, excitement)

3. Motivation

## \* MID-BRAIN

- NCERT
- Cerebral aqueduct passes through mid-brain
  - Located between Thalamus / hypothalamus of Forebrain and Pons of Hindbrain
  - Dorsal side : "4 Optic lobes" (4 Round swellings) Known as "Corpora quadrigemina"
    - 2 Superior Colliculi Control Visual reflex
    - 2 Inferior Colliculi Auditory reflexes
  - Ventral : Crus cerebri

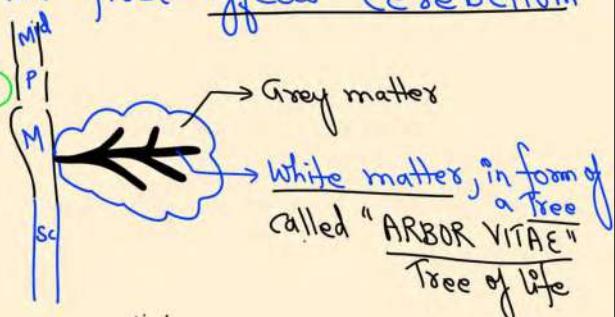
## \* HIND-BRAIN — 3 parts (Pons + Medulla + Cerebellum)

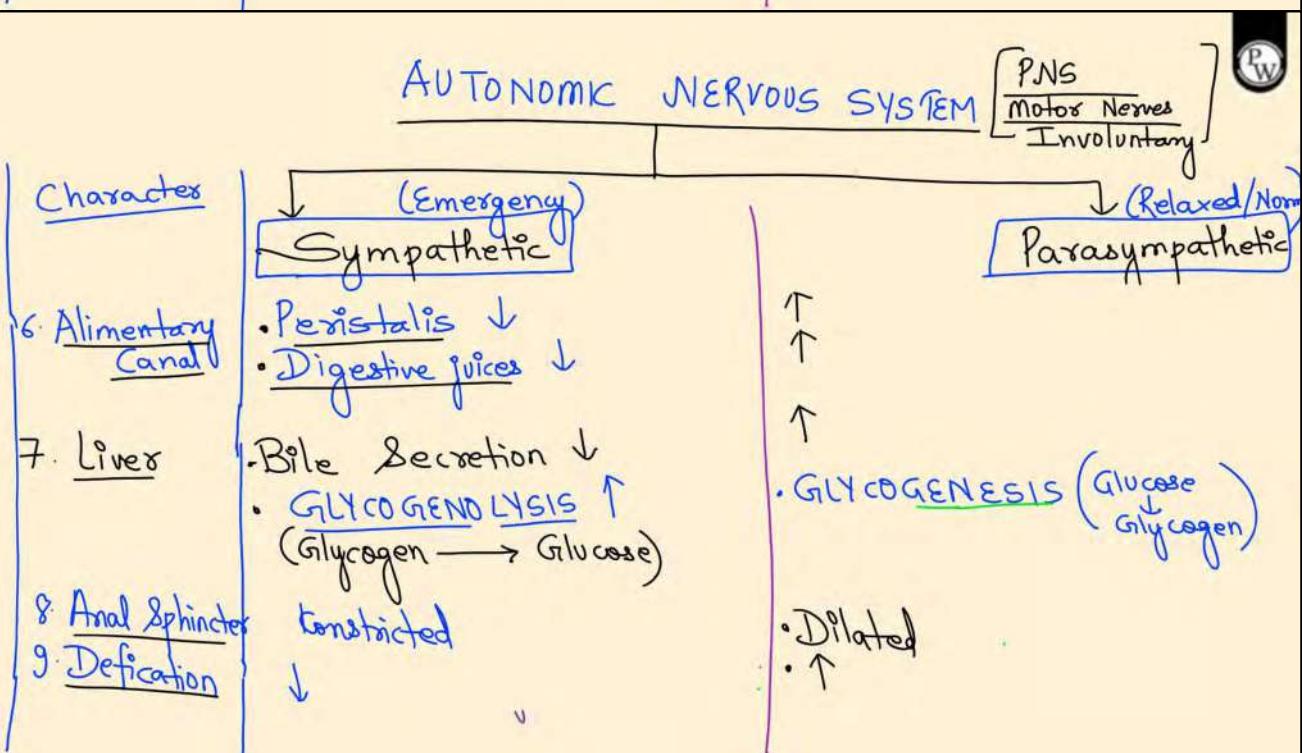
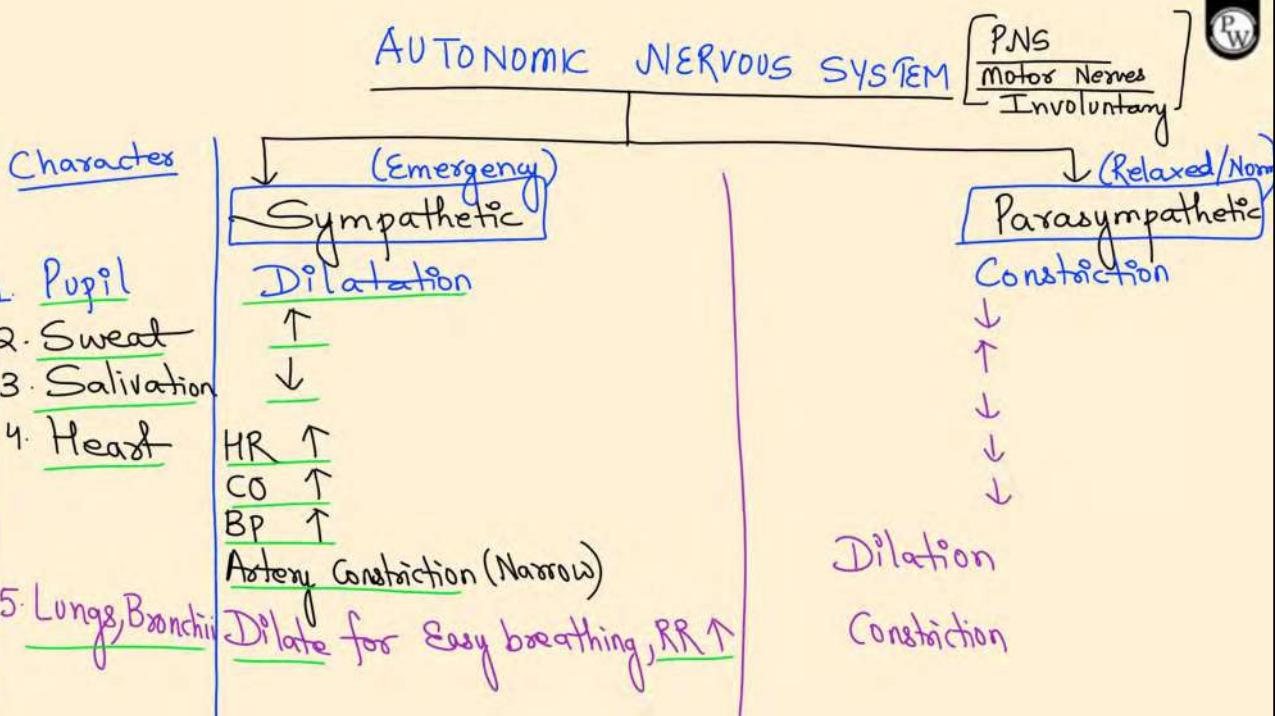
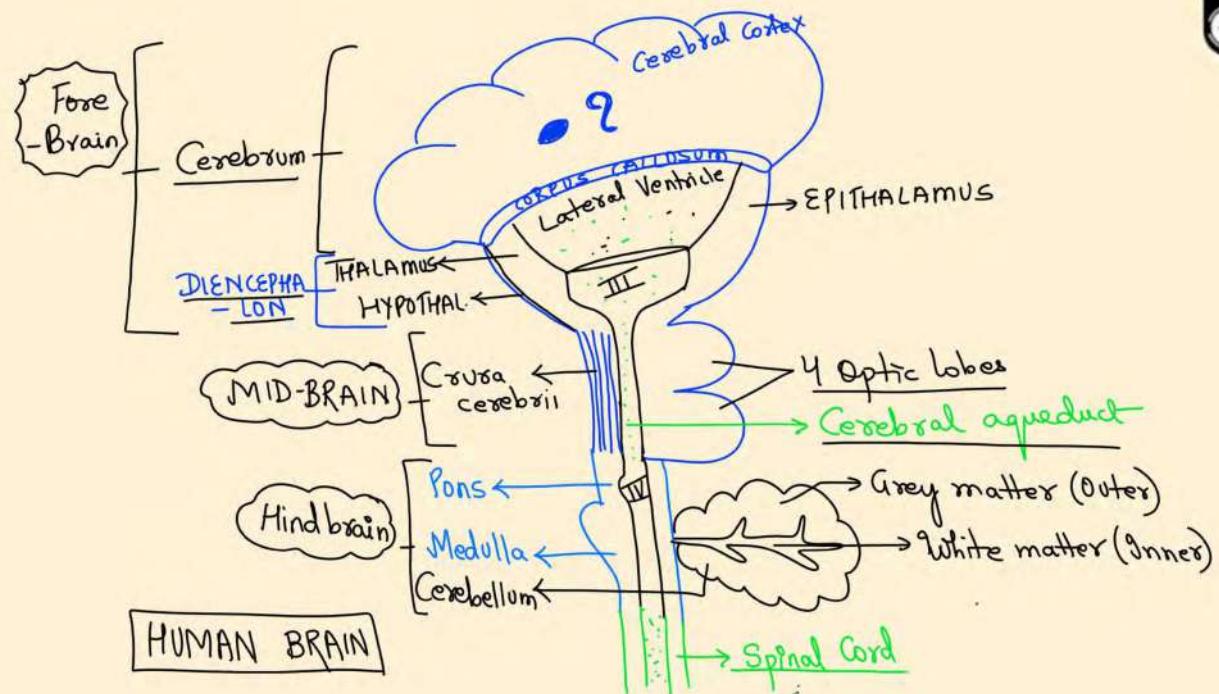
- PONS VAROLII = Bridge
  - Pneumotaxic Centre, which Moderates functions of RRC
  - Consists of fibre tracts that interconnects different regions of Brain
- Medulla Oblongata
  - NCERT: Controls Respiration, Gastric Secretions and Cardiovascular reflex
  - Connected to Spinal Cord
  - Respiratory Rhythm Centre (RRC)
  - Gastric Secretions Centre
  - Cardio-Vascular Centre
  - Vomiting | Sneezing | Coughing | Swallowing Centre

- CEREBELLUM (= Little Brain)
  - 2nd largest part
  - highly Convulated surface to provide additional space for more neurons
  - Role in "Balance of Body"
  - Alcohol first affects Cerebellum

## \* Brain Stem

- Brain Stem
  - = Midbrain + Pons + Medulla
  - = Midbrain + Hindbrain
  - Forms Connection between Brain and Spinal Cord





## AUTONOMIC NERVOUS SYSTEM

PNS  
Motor Nerves  
Involuntary

### Character

- 10. Urinary Bladder Muscles
- 11. Urethral Sphincters
- 12. Micturination
- 13. Adrenal Gland Secretions
- 14. Erector Pili Muscles (Goose flesh)

(Emergency)  
Sympathetic

• Relaxed

• Closed / Constricted



Contract

• Contract

• Dilated



Relaxed

(Relaxed/Norm)  
Parasympathetic



### Homework from Yakeen Module

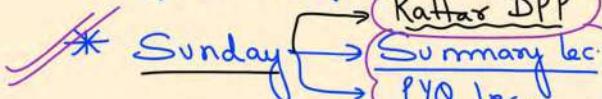
Today's topic

\* Revise lec- 4

Learn lec- 5

DPP

Read NCERT



\* Mon → Podcast (Neural..)

\* Tues → Podcast (Locomotion & Movt)



# THANK YOU

