

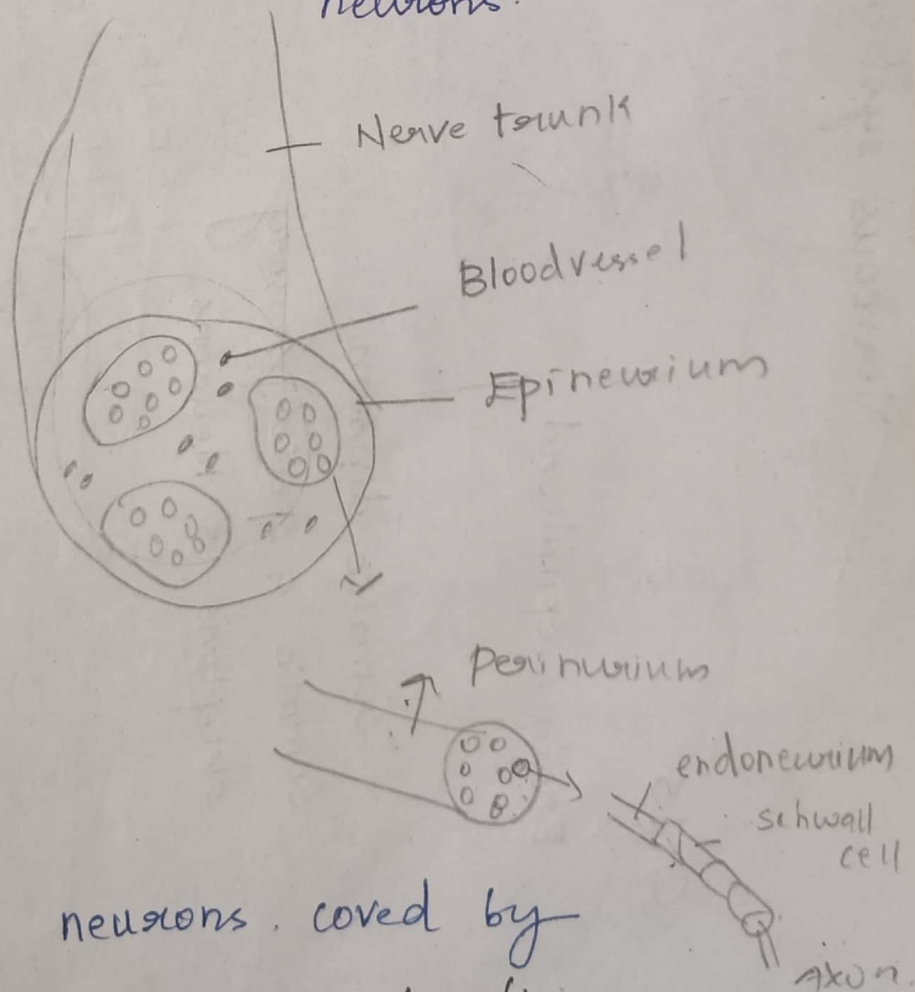
NERVOUS SYSTEM.

[Nervous system → Highly advanced network of specialised cells] Neurons.

→ Structural & Functional unit of (Nervous system) - coordinates.

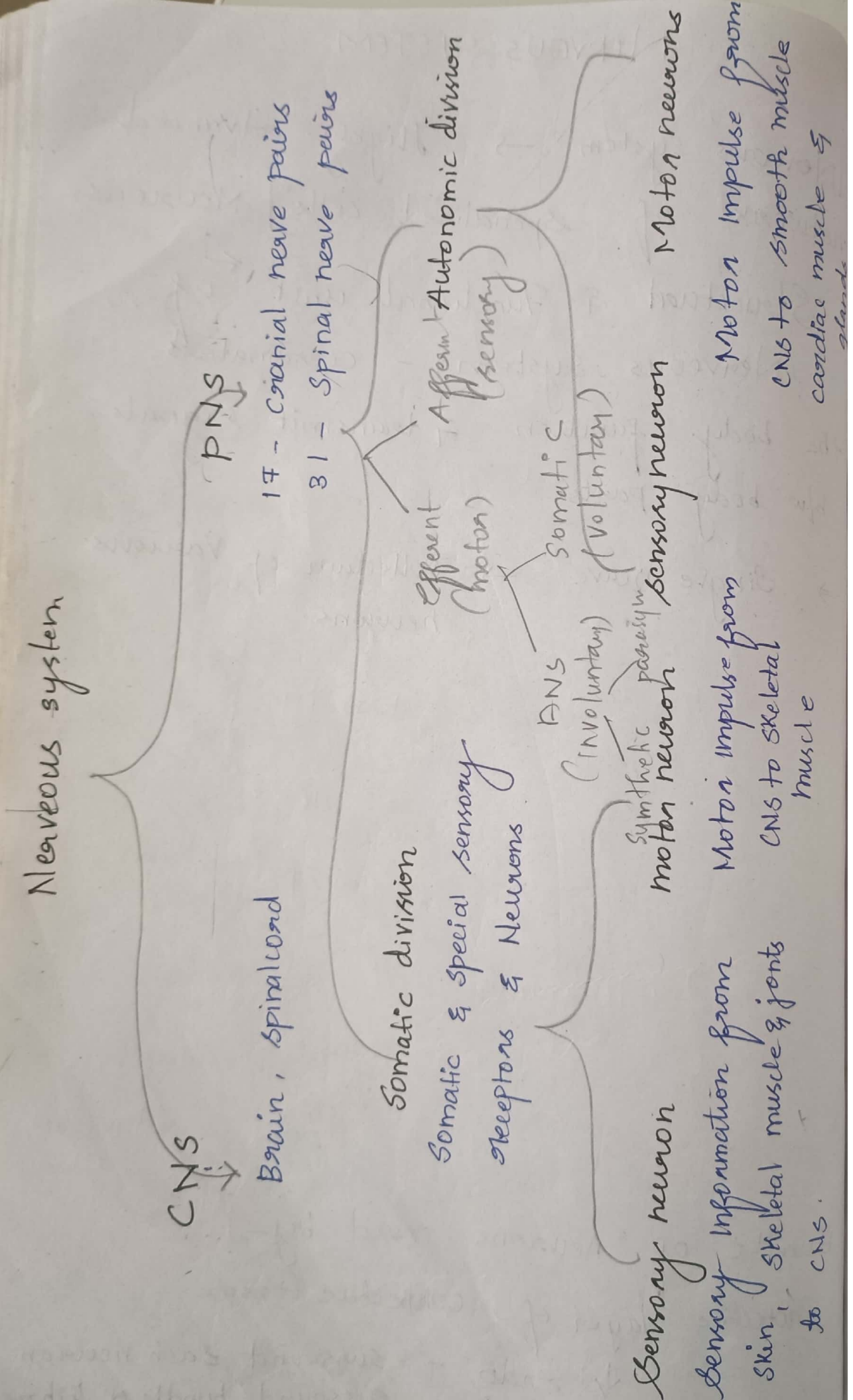
the body function & transmit signals b/w body parts

⇒ Single nerve → collection of various neurons.



Bundle of neurons. covered by Protective layer of Connective tissue.

- ↓ Endo - surround each neuron.
- peri - surround bundle of fibres
- epi - surround Nerve fibre bundle



① Dura mater

⇒ This is first & outermost part, lying inner side of cranium.

⇒ Thick & durable membrane.

⇒ Inner surface of vertebral column surround by walls of vertebral column on one side dura mater on other side.

⇒ Space in b/w called Epidural space.
(Adipose tissue)
Act as a cushion

② Arachnoid membrane

⇒ It's the middle thin, spider web like membrane covers the brain

⇒ It is surrounded by pia mater & Dura mater

⇒ Made of Reticular connective tissue.

⇒ Blood vessels enters into brain may pass through this space.

CNS.

⇒ Brain & spinal cord
↓ connected ↓
Vertebral canal.
Inside skull (85 billion neurons).

⇒ Brain is within the skull

⇒ Spine is within the vertebral canal
with is connected to brain

⇒ The Neural tubes within embryo.
develops into Nervous system

⇒ Neural tubes expansion

① Forebrain ② Midbrain ③ Hindbrain

⇒ Cerebral hemisphere

⇒ Basal ganglia

⇒ Thalamus.

⇒ Hypothalamus.

⇒ Tectum

⇒ Tegmentum

⇒ Cerebral peduncles

⇒ cerebellum

⇒ pons.

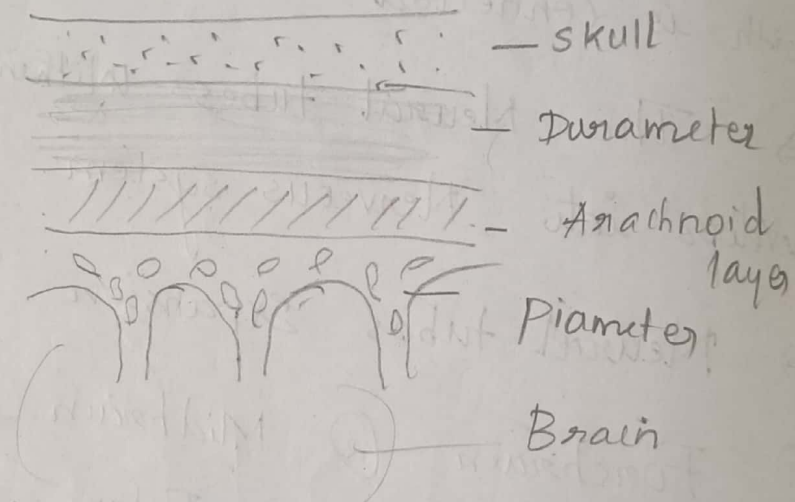
⇒ Medulla

Meninges of Brain

⇒ Membranous layer of connective tissue surrounds brain & spinal cord

⇒ Brain ⇒ Cranial meninges

⇒ Spinal cord ⇒ Spinal meninges



3 Membranes of Meninges

① Dura mater

② Arachnoid

③ Pia mater

①. Dura mater

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Pia-meter

pia - Tender / delicate / soft / thin
Mater - mother.

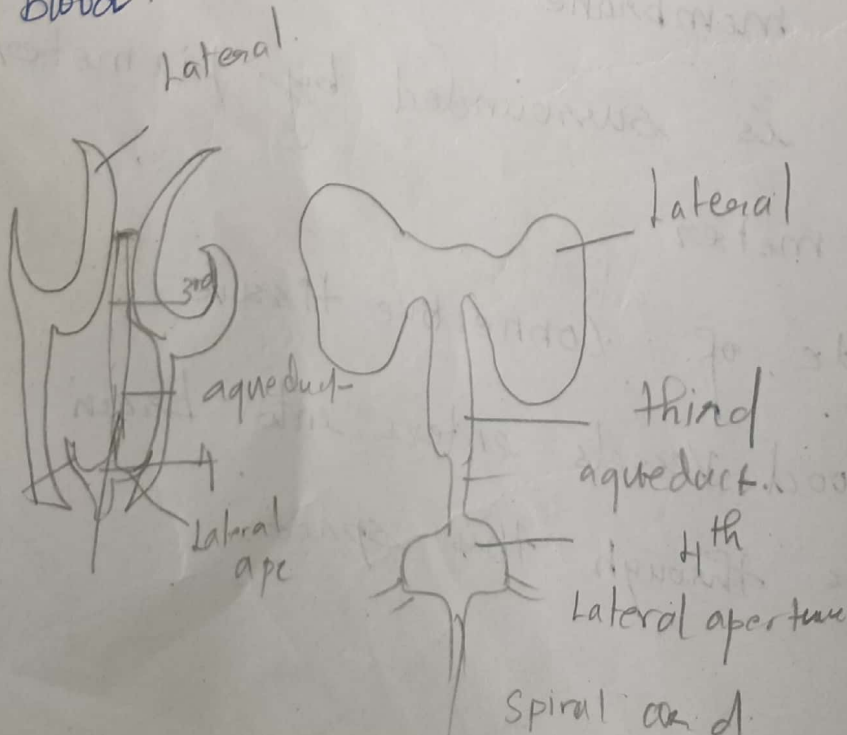
⇒ It's thin delicate innermost layer, situated next to brain & spinal cord.

⇒ Arranged by network of connective tissue and have blood vessels.

Functions

⇒ Provide protection to brain

⇒ Carry out exchange of nutrients & waste production b/w Nervous tissue & blood.



Ventricles of Brain

Ventricles are cavity in brain filled with CSF (Cerebrospinal fluid).

There are 4 Ventricles

2 - lateral ventricle (Each cerebral hemisphere)

⇒ C-shaped large chamber

⇒ 3rd Ventricle - Diencephalon

Narrow cavity located in Midline

⇒ Superior to hypothalamus or b/w left & right halves of thalamus

Foramen of Monro - channel b/w

2 - lateral & 3 - ventricle

⇒ 4th - hindbrain, (i.e.) b/w brainstem

& cerebrum

⇒ 3 opening (i.e.) paired lateral aperture & Median aperture

4th → connected to 3rd. by
cerebral aqueduct.

Cerebral Spinal fluid

- ⇒ Clear fluid.
- ⇒ Present in the brain's Ventricular System and in subarachnoid space.
- ⇒ Lymph is replaced by CSF in CNS.
- ⇒ Present b/w arachnoid & pia mater.
- ⇒ Act as a cushion / buffer for cortex.
- ⇒ Mechanical & Immunological Protection to brain.

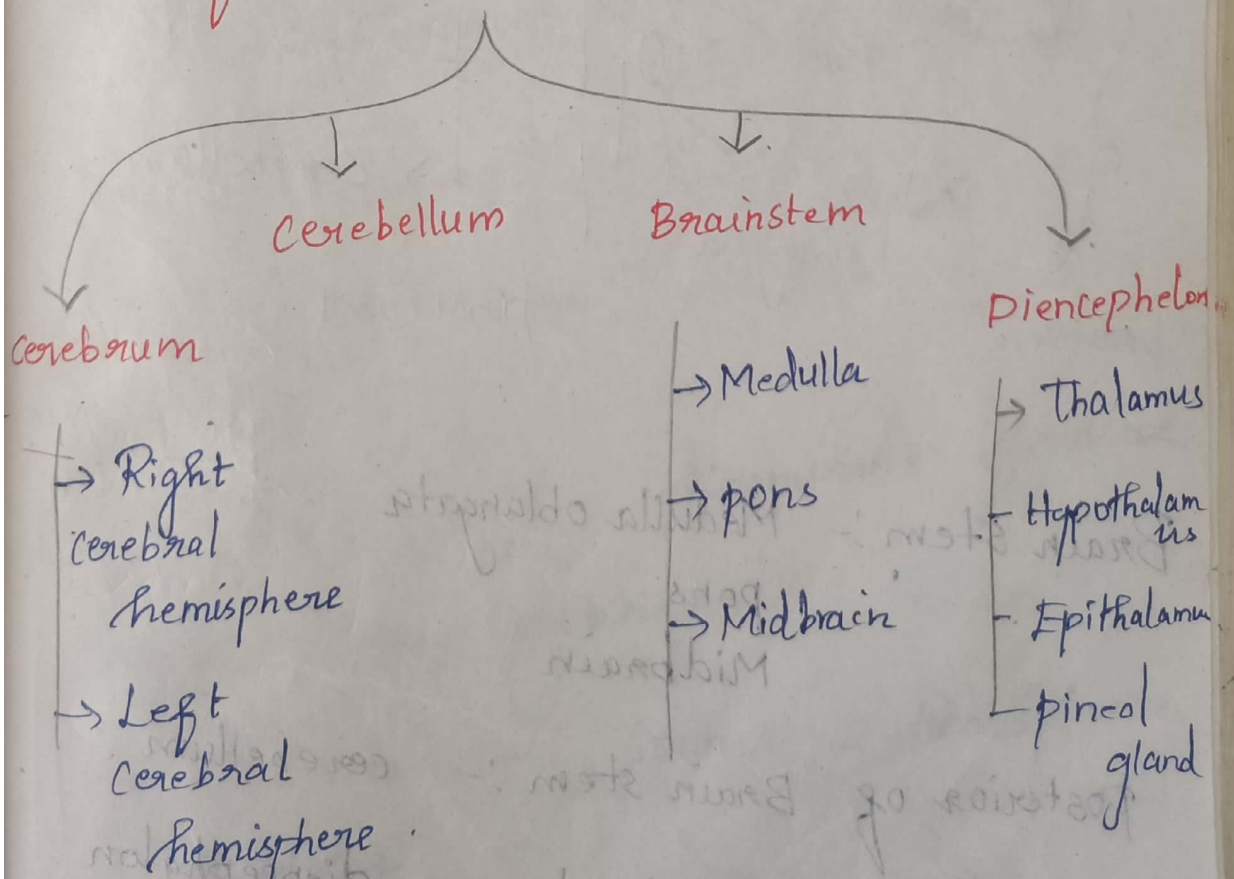
Functions

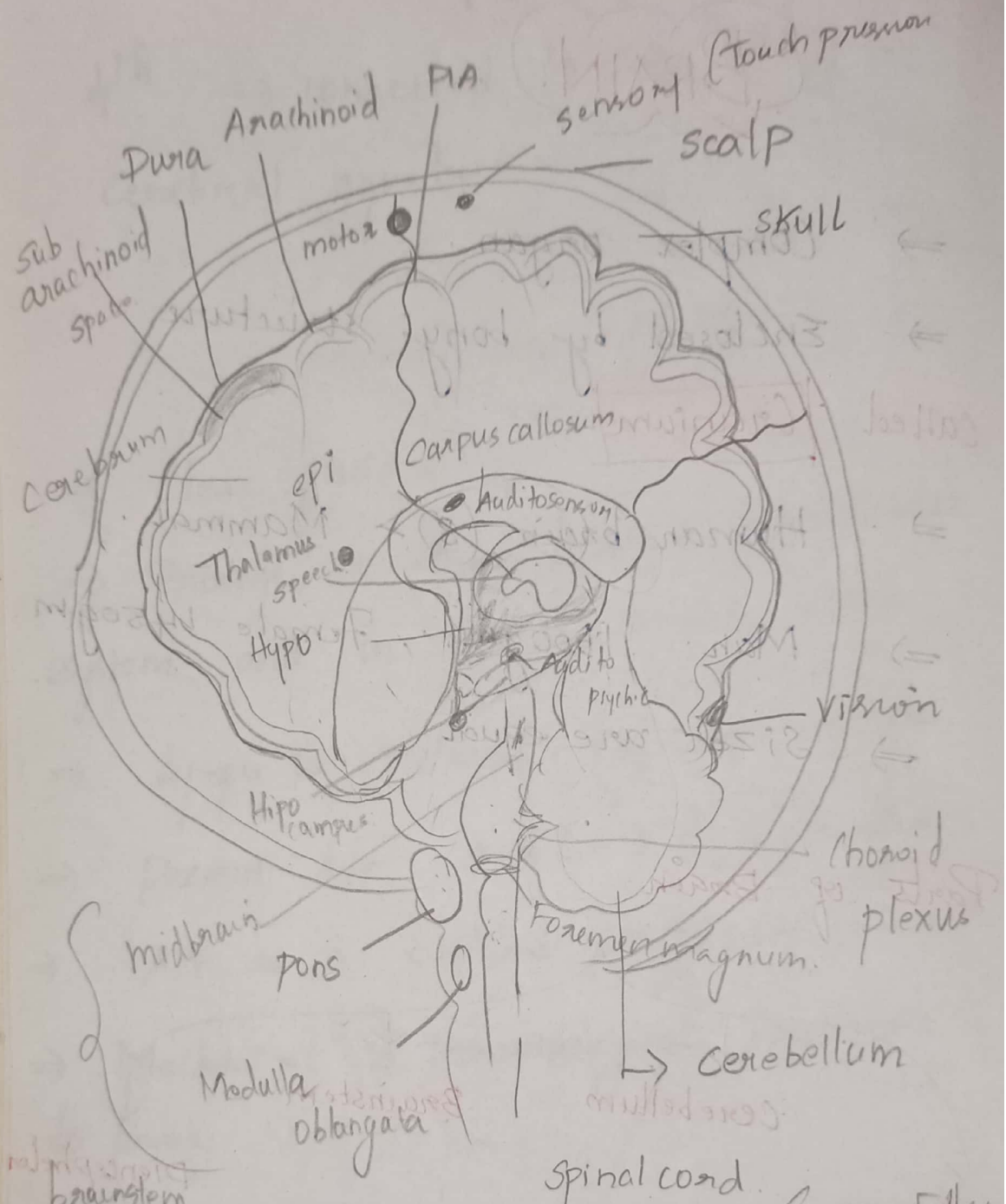
- ⇒ Exchange of Nutrients & waste product among blood & Nervous tissue.
- ⇒ Protect brain & spinal cord.
- ⇒ Uniform pressure of CSF should be maintained.
- ⇒ Absorb shock by acting as cushion.
- ⇒ Brain & spinal cord is moist due to CSF.
- ⇒ Homeostasis.

BRAIN.

- ⇒ Complex organ.
- ⇒ Enclosed by bony structure called Cranium.
- ⇒ Human brain (3) > Mammal.
- ⇒ Man 1600gm, Female 1450gm.
- ⇒ Size are equal

Parts of Brain.





Brain stem :- Medulla oblongata
Pons
Midbrain

Posterior of Brain stem :- cerebellum.

Superior of Brain stem - diencephalon.

On Brain stem & diencephalon - cerebrum
(Forebrain)

① Cerebrum

⇒ Major portion of brain

⇒ 2 cerebr. hemisphere



Cerebral hemisphere.

⇒ Outer rim (grey matter) - **cerebral cortex**

⇒ Inner (white matter). **cerebral medulla**

⇒ During Embryonic development.

Cortical region → seven in folding (grooves). **gyri**

deeper grooves → **Fissure**

Shallow grooves → **sulcus**
(space.)

Longitudinal fissure: Prominent fissure

Separate the cerebrum.

Corpus callosum — Connect 2 hemisphere

↓ Internally.

nerve fibre that relay information b/w hemisphere

Left hemisphere - control Right side
of body

Right hemisphere - Left side

Each of hemisphere has 4 lobes.

① Frontal

② Temporal

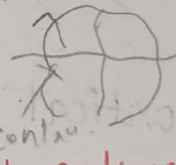
③ Parietal

④ Occipital

F from P - Central sulcus

F from T - lateral cerebral sulcus

P from O - parietooccipital sulcus



Function of cerebrum

- ⇒ control Voluntary activities.
- ⇒ Receive & process information
- ⇒ Mental activities
- ⇒ Sensory perception
- ⇒ Initiation & control over contraction of voluntary muscle

Cerebral cortex (grey matter)

⇒ Outer layer covers cerebrum

⇒ Thickness 1.5-5mm.

⇒ Nerves not insulated (white) color

⇒ Left & right hemisphere
($\frac{2}{3}$ of brain mass).

⇒ Thinking, perceiving, producing & understanding language.

(White matter) Cerebral medulla

Axon of Myelinated & non myelinated.

① Association Tract

⇒ same cerebral hemisphere

⇒ Conduction of Nerve impulse from
1 gyrus → another

② Commissural Tract

⇒ conduction of nerve impulse b/w
corresponding gyrus (i.e.) 1 hemisphere → other

③ Projection Tract

⇒ Nerve impulse from cerebrum

→ Brain & Spinal cord
(other parts)

Medulla oblongata.

⇒ 2.5 cm long — lower half of brain stem. continues to spinal cord

⇒ Within the cranium above **Foramen**

⇒ outer part → white **magnum**
Inner part — grey

Functions

⇒ The motor nerves from cerebrum. pass ~~at~~ through pyramidal tract intercross and reach spinal cord

R — Left cerebral hemisphere
L — R "

→ Cardiovascular center: — Control Rate & force of cardiac contraction

→ Respiratory center: — Rate & depth of Respiration

(Diaphragm contracts
Intercostal muscles stimulate } from RC → phrenic & Intercostal nerve
↓ Inspiration

⇒ Vasomotor center — Diameter of Blood vessels

⇒ Reflex center — Noxious in Respiratory tract or stomach

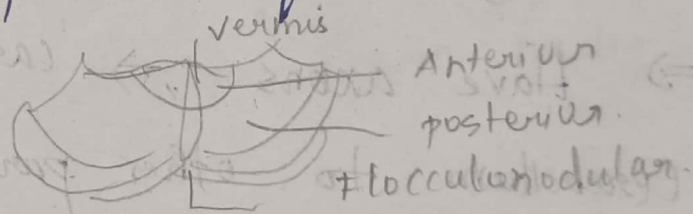
Cerebellum

⇒ Forming the lower part of brain located beneath cerebral hemisphere.

⇒ Transverse fissure separates cerebrum from cerebellum.



⇒ Cerebellum (butterfly shape). located inferior & posterior of (Cerebrum, pons & medulla).



⇒ Vermis is the central area. Separates the two cerebellar hemisphere.

⇒ These hemisphere also contain lobes.

⇒ Anterior & posterior lobes → controls the movement of skeletal muscle.

⇒ Flocculonodular lobes → Maintains equilibrium and balance of body.

⇒ Cerebral cortex (outer layer)
↓
Covers the cerebellum (grey matter)

⇒ Have a sequence of slender
& parallel ridges ⇒ Folia

⇒ White matter is located deep to
grey matter ⇒ Axon vitae (branched
tree)

⇒ Cerebellar nuclei (grey matter)
located inside the (white matter)

⇒ Have axons → carry impulses from
Cerebellum to other parts of brain &
Spinal cord

⇒ Cerebellum attached to brain stem
by 3 paired cerebellar peduncles

(Axons → conduction of impulse b/w.
Cerebellum & other parts of brain

↓
Superior cerebellar peduncle;
Inferior;
Middle

Superior

Axon extends from cerebellum to nuclei (red) of Midbrain & thalamic nuclei

Inferior

⇒ Transmit sensory information from Vestibular (inner ear) to cerebellum.

⇒ proprioceptors to cerebellum.

Middle

⇒ conduction of impulse of Voluntary movements from pontine nuclei to cerebellum.

Functions

⇒ Maintain Body posture & equilibrium.

→ Controlling & coordinating movement

— coordinates Voluntary muscular movement

Anatomy of pons

Pons :- Above the ^{Medulla} brain stem
below the Midbrain

⇒ Nerve fibres forms a bridge between
2 cerebral hemisphere.

⇒ Fibres transverse brain &
Spinal cord.

⇒ Pons attached to cerebellum with the
help of Middle cerebellar peduncles

⇒ Has two surface (i.e) Anterior &
posterior.

⇒ Have Grey matter → Nuclei (i.e)
cell body
White matter — nerve fibres

Functions

Breathing centre.

* Inspiratory center provoked (deep inspirat)

* " Inhibited Apneustic centre
pneumotaxic center
Cns — expiration

⇒ Synapsis of descending motor nerves
↓
pons

→ Insufficiency in activities (motor neurons) / para

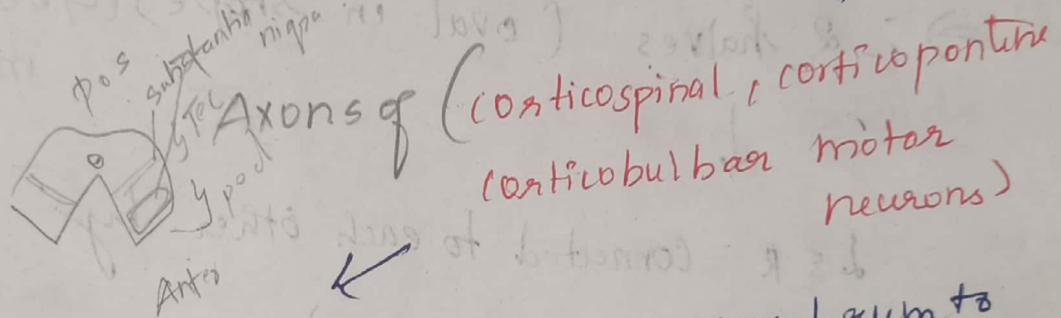
Midbrain (Mesencephalon)

⇒ Tracts & Nuclei

⇒ Two part :- Dorsal (tectum)
Ventral (penduncle)

Penduncles :- Anterior

⇒ Ascending & Descending tracts.



⇒ conducting impulse from cerebrum to Spinal cord, pons & Medulla.

⇒ Sensory neurons from Medulla to Thalamus (C. cerebral peduncles).

Tectum :- posterior

-(4) ground elevations) (nuclei, reflex, central)

2 - positioned superiorly → Superior colliculi (eye, head, neck - visual stimuli) hill.

2 - Inferiorly - Inferior colliculi

↓ Impulse from ear to thalamus.

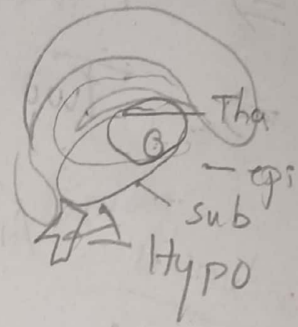
Reflex Centre for (Sudden movement)

of head / Left & R substantia nigra - large size & pigmented

Diencephalon (Refer Book).

⇒ from Cerebrum → Brain stem

⇒ Surrounds 3 Ventricle

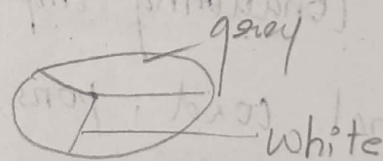


① Thalamus (80%).

⇒ 2 halves (oval in shape) (Gray matter)



L & R connected to each other by Intermediate mass (tissue band).



(Internal medullary lamina)

Func

⇒ Point of communication b/w subcortical

& cerebral cortex

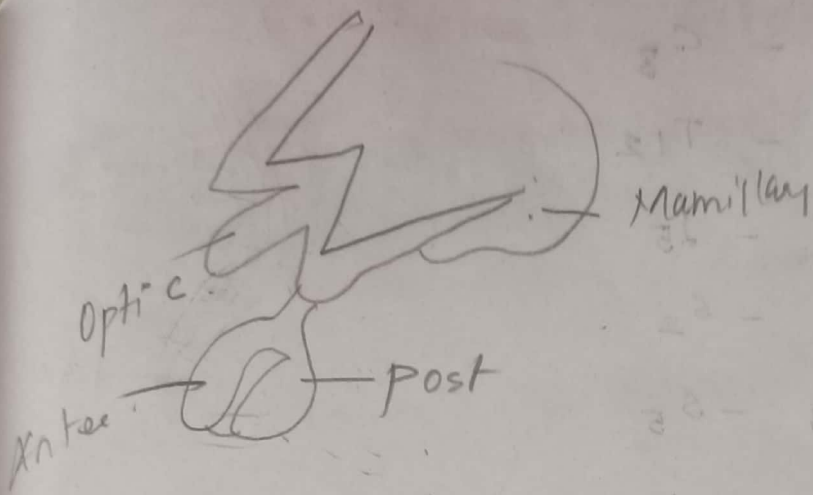
⇒ Acts as primary relay station → Relay areas

⇒ Processing (Cerebral cortex)

Relaying (Thalamus)

→ Regulate sleep & wakefulness

→ Control motor function



Spinal cord.

⇒ Elongated part of CNS extends to the lower end.

⇒ Cylindrical shape & upper 2/3 of Vertebral canal.

⇒ Upper border & lower border.

⇒ Pathway for sensory input to brain
Motor output from brain

⇒ Spinal nerves (31 pairs)

↓
Maintain Homeostasis | (quick & reflexive response to stimuli).
↓
Spinal cord reflex

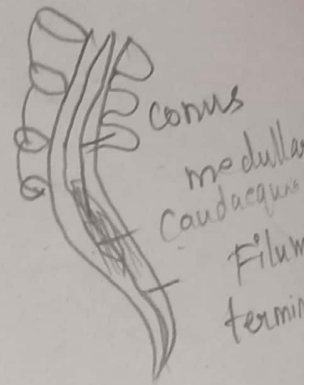
C₁ - C₈

T₁ - T₁₂

L₁ - L₅

S₁ - S₂

S₃ - S₅



External structure

⇒ 2 enlargements (cervical & lumbar)



from upper limb.

lower limb

(C₄ - T₁)

(T₉ - T₁₂)

⇒ Spinal nerves (pairs) either side of spinal cord.

⇒ Nerves of cervical segment → cervical nerves form **plexus** (network of nerves)

⇒ Two grooves :- { Anterior median fissure
posterior median sulcus.

~~find~~ found along the length of spinal cord

Conus Medullaris (cone shape)
ends at lumbar vertebra (L1 & L2)

Filum terminale (terminal filament)
from conus medullaris → coccyx

cauda equina. — starts from spinal cord
terminal

Internal structure

⇒ Made of grey & white matter.

Grey → H or butterfly shape (commissural grey)
surrounded by white matter.

Grey → dendrites, neuronal cell bodies.
non-myelinated axon & neuroglia

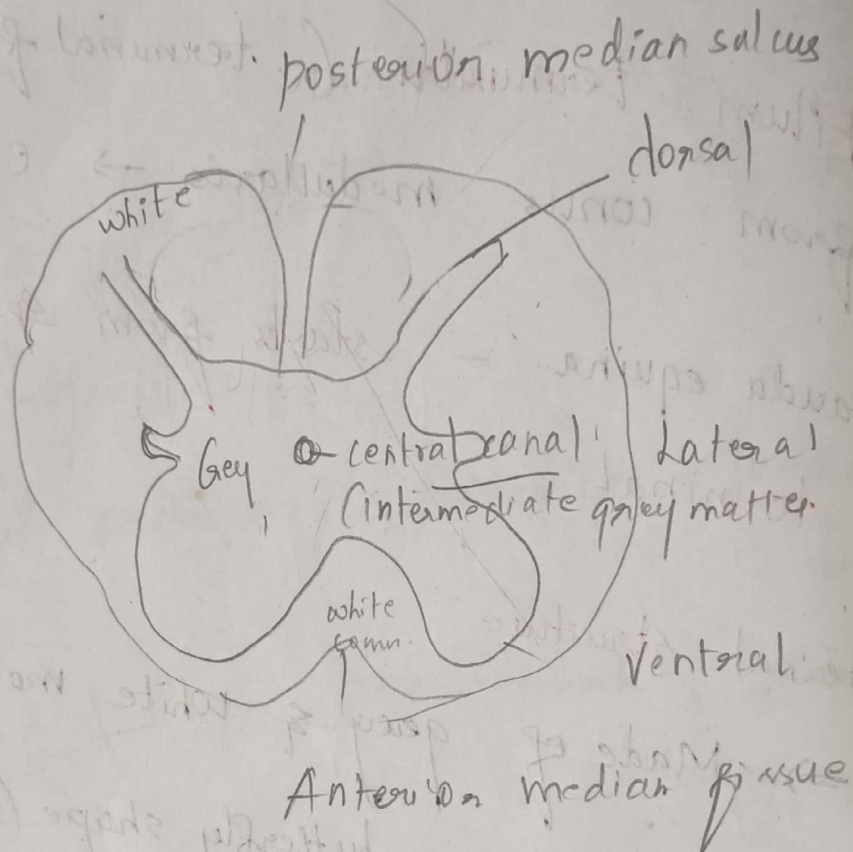
white — myelinated axon.

Inside commissural grey — CSF filled.
(Central canal)
↓
with ventricle.

Horns → either side of spinal cord.

Anterior — Ventral horns } intermediate
Posterior — Dorsal horns } grey matter

Small projection of grey
grey matter — lateral horns



Functions

- ⇒ Sensory & Motor tracts are present in white matter.
- ⇒ Sensory → Impulse → brain
- ⇒ Motor → Impulse ← from brain
- ⇒ Grey matter → contains spot for integration of excitatory & inhibitory post synaptic potentials.
- ⇒ CNS connected to receptors, muscles, glands with the help of spinal nerves.
- ⇒ Reflex activity