

**Jordan University
Faculty Of Medicine**



Nervous System Part 1

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The nervous system

It is divided into 2 major divisions:

1) Central Nervous System (CNS): found within the bones & consists of:

- * The Brain: within the skull
- * The spinal cord: within the vertebral canal.

2) Peripheral Nervous System (PNS): Consists of:

A) Autonomic nervous system (ANS) : supplies involuntary structures, e.g.

Cardiac muscle and Smooth muscles which is divided into:

- * Sympathetic nervous system.
- * Parasympathetic nervous system.

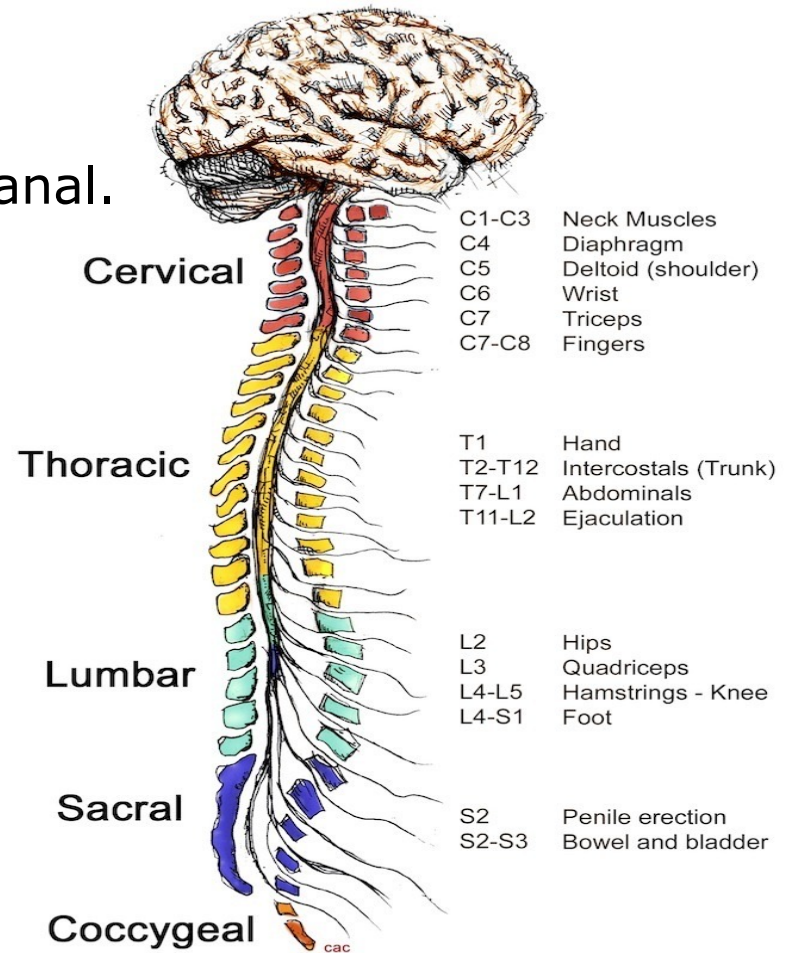
B) Somatic nerves (SNS): supplies Voluntary structures body wall and limbs.

- * Cranial nerves (12 pairs): Connected to the brain.
- * Spinal nerves (31 pairs): Connected to the spinal cord.

The central nervous system

It consists of:

- 1) The brain: Within the skull.
- 2) The spinal cord: Within the vertebral canal.



THE BRAIN

It consists of:

1) Cerebrum:

- 2 Cerebral hemispheres separated from each other by median fissure
- Diencephalon

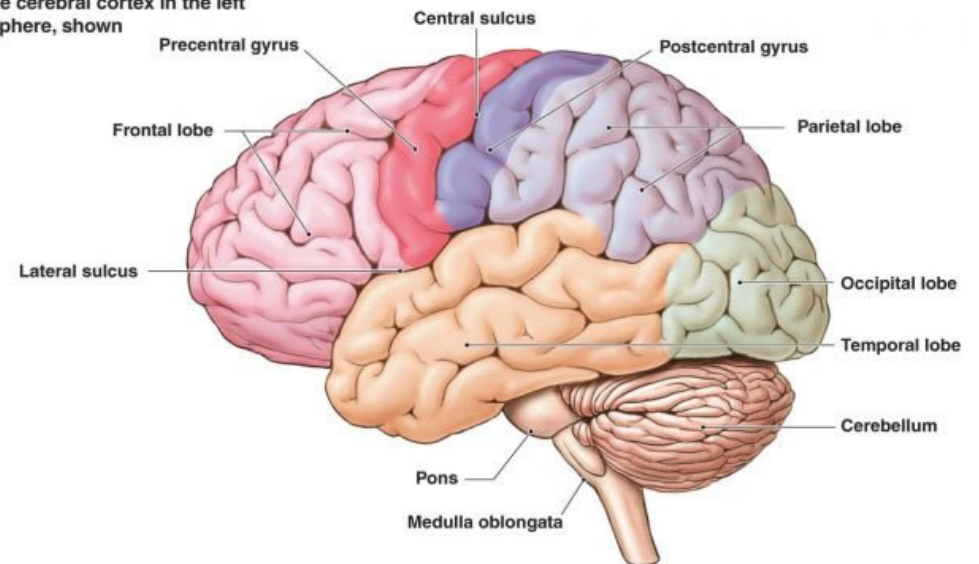
2) Brain Stem:

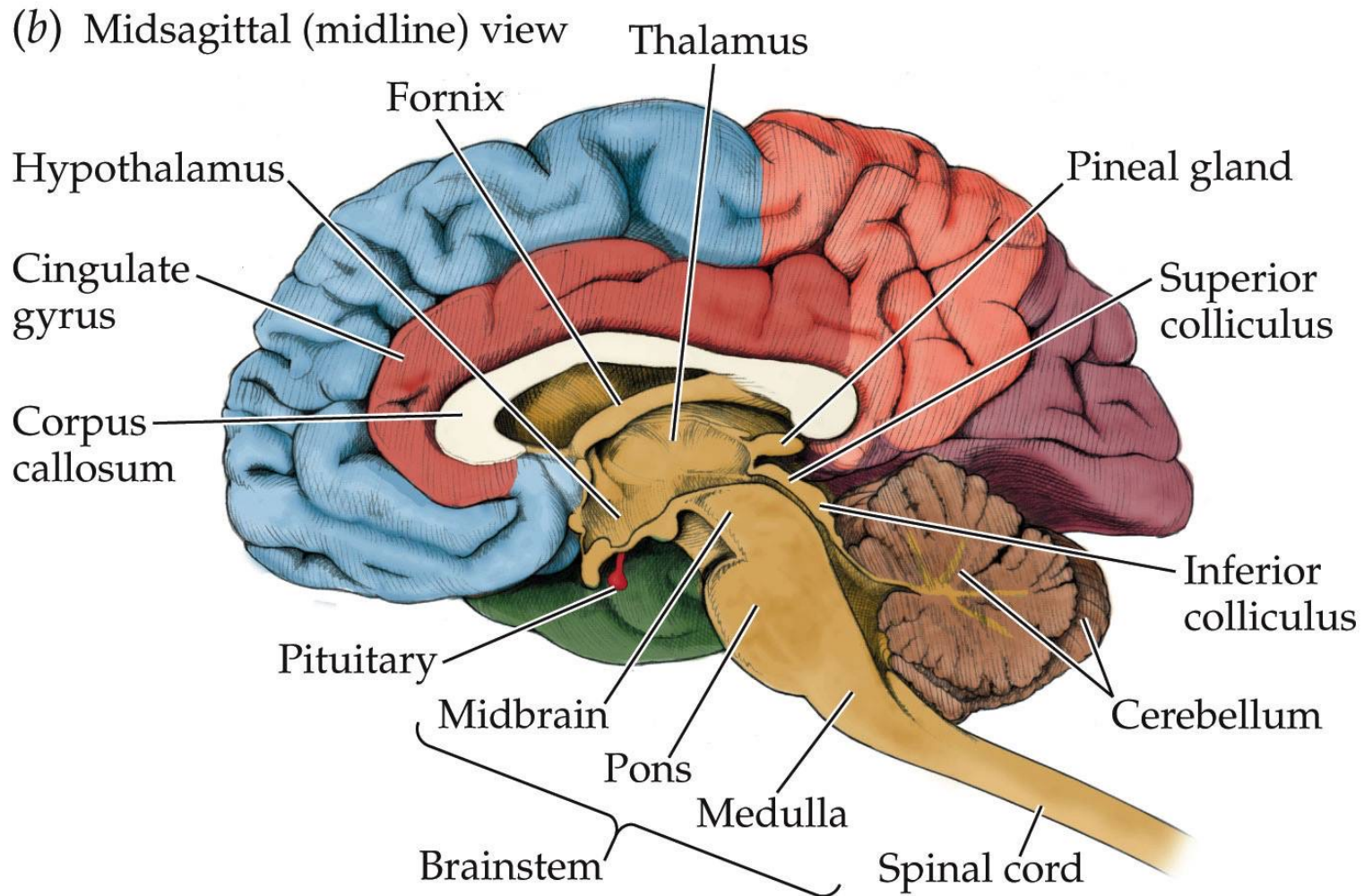
- Midbrain
- Pons
- Medulla

3) Cerebellum:

A lateral view of the brain showing the lobes of the cerebral cortex in the left cerebral hemisphere

The lobes of the cerebral cortex in the left cerebral hemisphere, shown in lateral view

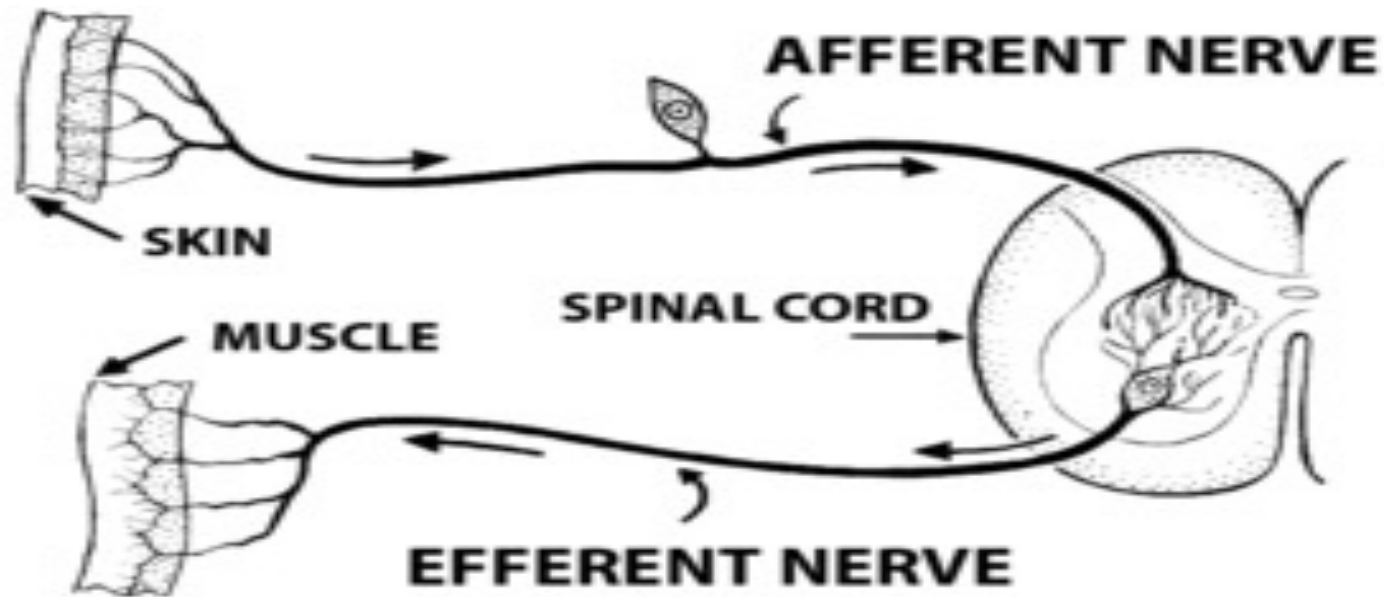




Biological Psychology 6e, Figure 2.12 (Part 2)

Functional Classification of Neurons:

- 1) **Afferent (sensory) neurons:** convey information from tissues and organs into the central nervous system (CNS).
- 2) **Efferent (motor) neurons:** transmit signals from the CNS to the effector organs (muscles & glands).



Cranial Nerves

Watch this video

<https://youtu.be/sAFaTaavmO8?feature=shared>

Key Facts of cranial nerves

- Like spinal nerves, **cranial nerves** are bundles of sensory or motor fibers that innervate muscles or glands; carry impulses from sensory receptors.
- There are **twelve** pairs of cranial nerves, which are numbered I to XII (1 :12)
- They are called **cranial nerves** because they emerge from brain and passes through foramina or fissures in the skull.

Cranial Nerve Fibers

Afferent (Sensory)

Efferent (Motor)

Somatic

Visceral

Somatic

Visceral

General (GSA)

Special (SSA)

General (GVA)

Special (SVA)

General (GSE)

Special (SSE)

General (GVE)

Special (SVE)

cutaneous sensation (pain, temperature, ect.)

vision, hearing, equilibrium

visceral information such as distention of organs and viscera

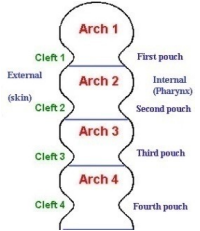
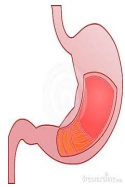
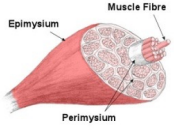
Smell Taste

Motor To Skeletal Muscles



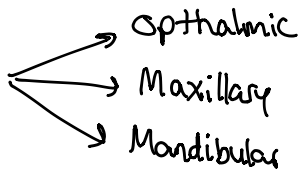
Autonomic Fibers, To smooth muscles, cardiac muscle, and glands

To Skeletal muscles derived from brachial arches



12 Cranial Nerves:

**Out Of Our Troubled Times
Arose Fear, Very Great
Violence And Hatred**

1. **O**lfactory
2. **O**ptic
3. **O**culomotor
4. **T**rochlear
5. **T**rigeminal 
 - Ophthalmic
 - Maxillary
 - Mandibular
6. **A**bducens
7. **F**acial
8. **V**estibulocochlear (**A**uditory)
9. **G**lossopharyngeal
10. **V**agus
11. **A**ccessory
12. **H**ypoglossal

MOTOR vs. SENSORY

Motor or Sensory? or Both?

Some Say Money Matters, But My Brother Says Big Brains Matter More

I – Sensory

II – Sensory

III – Motor

IV – Motor

V – Both

VI – Motor

VII – Both

VIII – Sensory

IX – Both

X – Both

XI – Motor

XII – Motor

| N | Name | Main Function |
|----|--------------------|--------------------------------------|
| 1 | O lfactory | Smell |
| 2 | O ptic | Vision |
| 3 | O culomotor | Movement of the eye |
| 5 | T rigeminal | Sensory to face |
| 7 | F acial | Motor to the muscles of the face |
| 11 | A ccessory | Motor to sternomastoid and trapezius |

Sensory :

Trigeminal Divided into

V1:Ophthalmic

V2:Maxillary

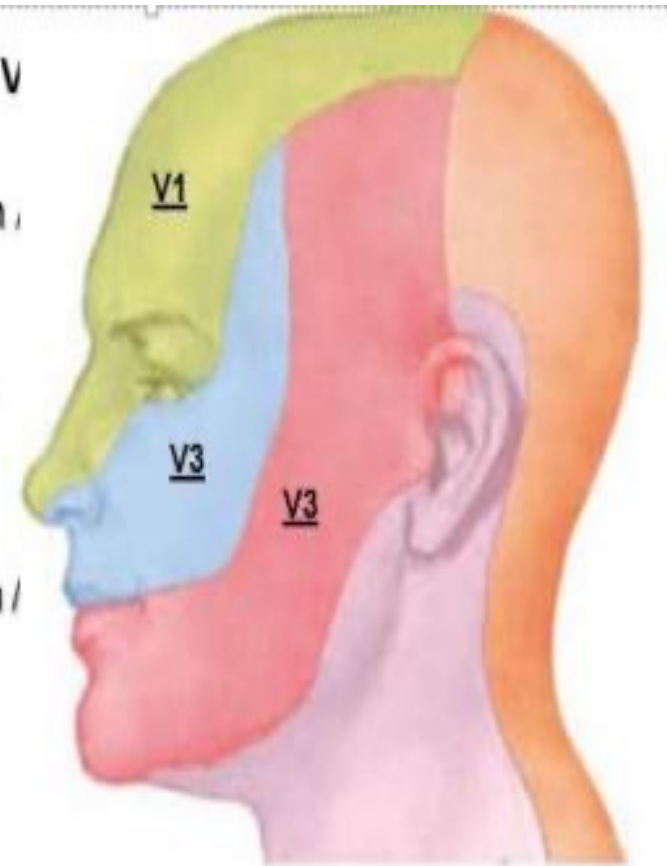
V3:Mandibular



Trigeminal Nerve /CN V

Branches:

1. Ophthalmic Division ,
Nerve (V1)
2. Maxillary Division /
Nerve(V2)
2. Mandibular Division /
Nerve(V3)



| N | Name | Attachment to the brain |
|----|---------------------------|-------------------------|
| 1 | O lfactory | Cerebrum |
| 2 | O ptic | |
| 3 | O culomotor | Midbrain |
| 4 | T rochlear | |
| 5 | T rigeminal | Pons |
| 6 | A bducent | |
| 7 | F acial | |
| 8 | V estibulocochlear | |
| 9 | G lossopharyngeal | Medulla |
| 10 | V agus | |
| 11 | A ccessory | |
| 12 | H ypoglossal | |

Thank you!



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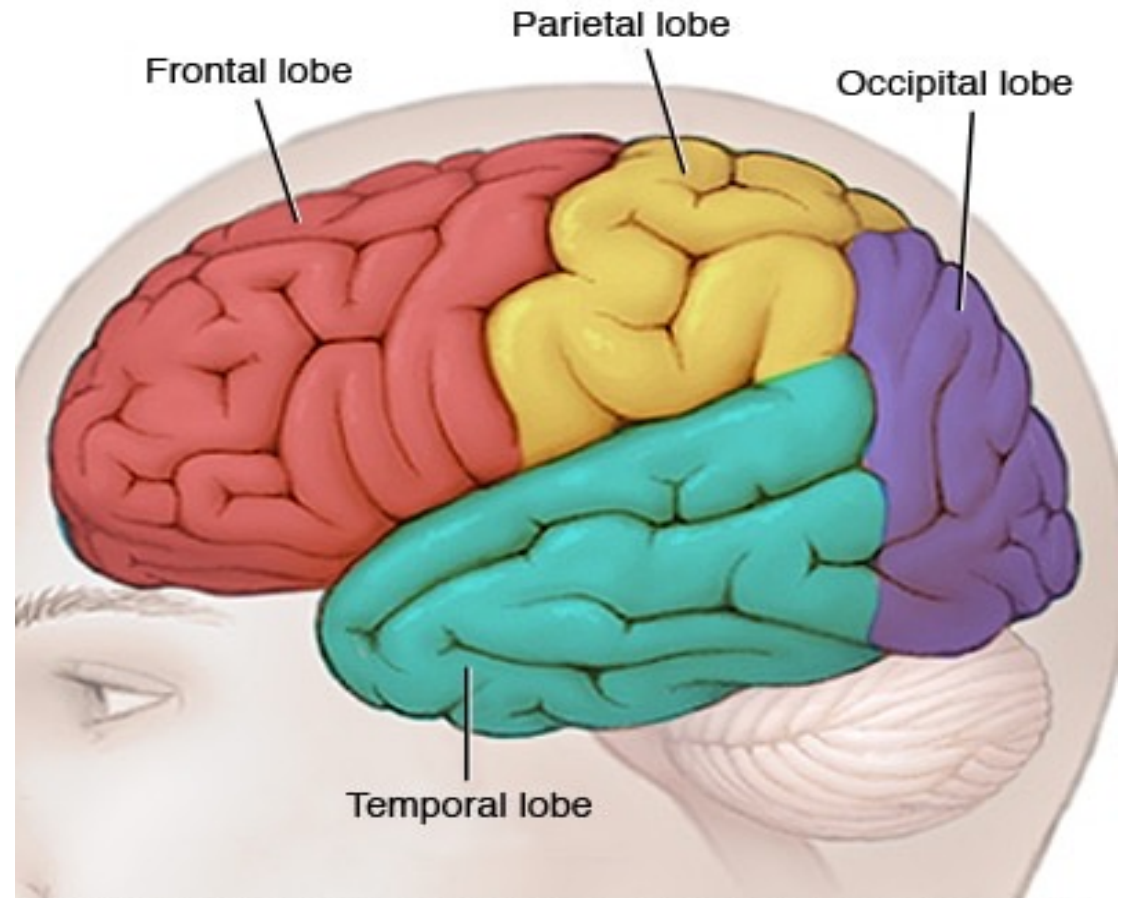
Nervous System Part 2

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THE CEREBRAL HEMISPHERES

- The cerebral hemisphere is divided into 4 lobes by
 - The central sulcus.
 - Lateral fissure.
- Each hemisphere is divided into 4 lobes:
 - Frontal lobe.
 - Parietal lobe.
 - Temporal lobe.
 - Occipital lobe.



The main functional areas of the different lobes of the brain

The Frontal lobe:

- Contains **motor area** which controls muscles of the opposite half of the body.



The parietal lobe:

- Contains the **sensory area** for the opposite half of the body.



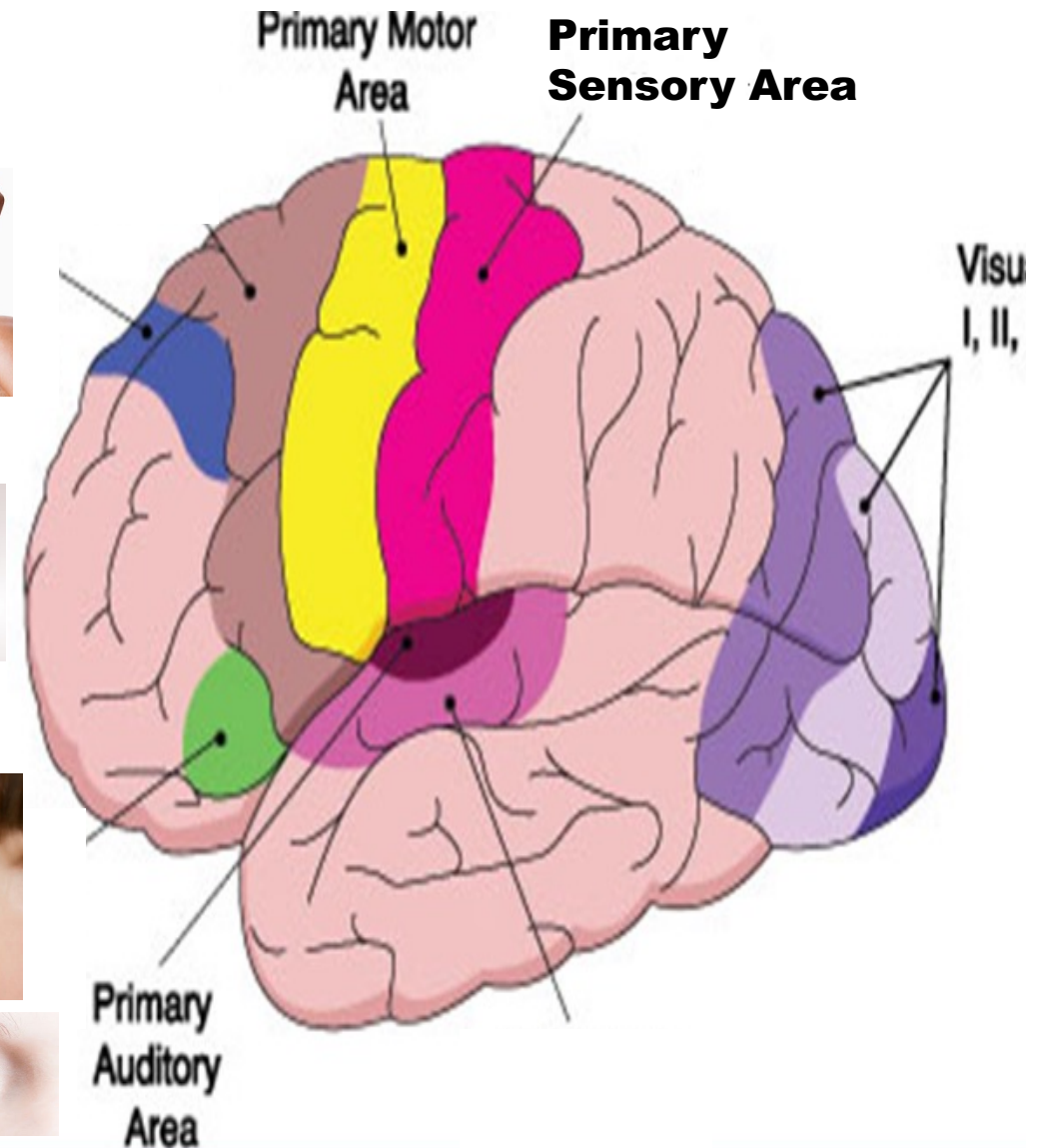
The temporal lobe:

Contains **hearing center**



The occipital lobe:

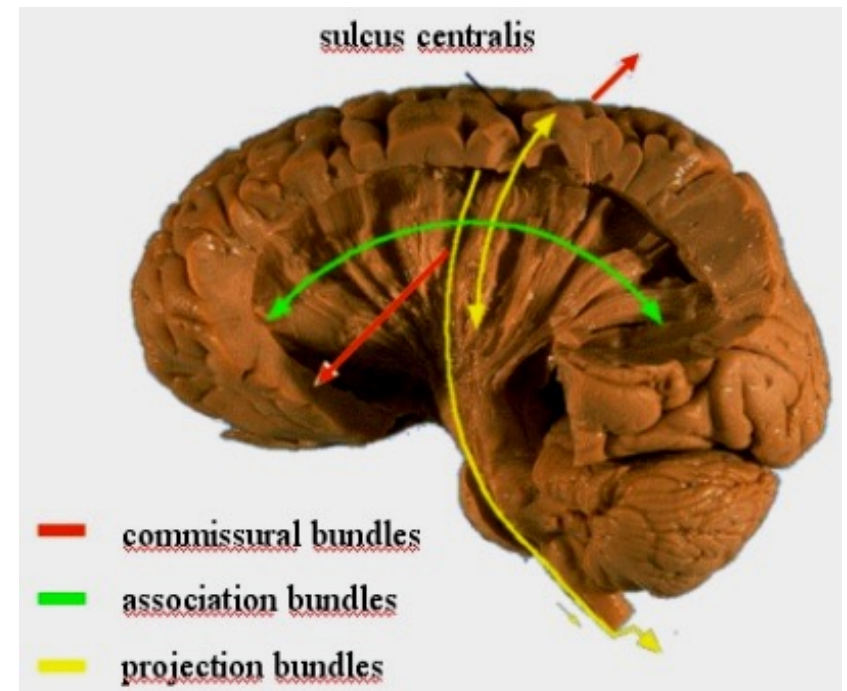
Contains center for **vision**



The white matter of the brain

The white matter of the brain consist of:

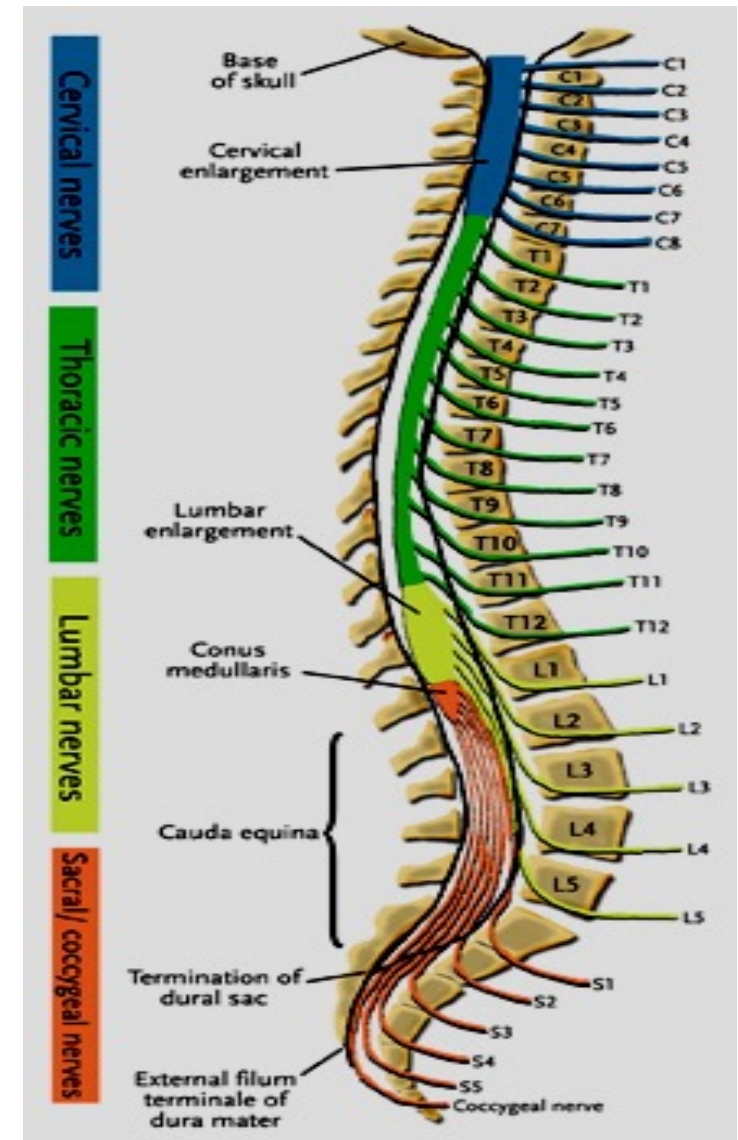
- 1) **Association fibers:** Connect different areas in the same hemisphere.
- 2) **Commissural fibers:** Connect similar areas in the 2 hemispheres as corpus callosum
- 3) **Projection fibers:** **Fibers** from & to the cerebral cortex as internal capsule



The Spinal Cord

Gross features:

- It is **cylindrical** in shape, about **45 cm** in length .
- It begins at the upper border of atlas vertebra (C1)
- It ends at the intervertebral disc between the **1st & 2nd lumbar vertebrae**.
- Its lower end is conical in shape & is known as "**Conus Medullaris**"
- It Organized into 31 spinal segments
 - Cervical : 8
 - Thoracic : 12
 - Lumbar : 5
 - Sacral : 5
 - Coccygeal : 1



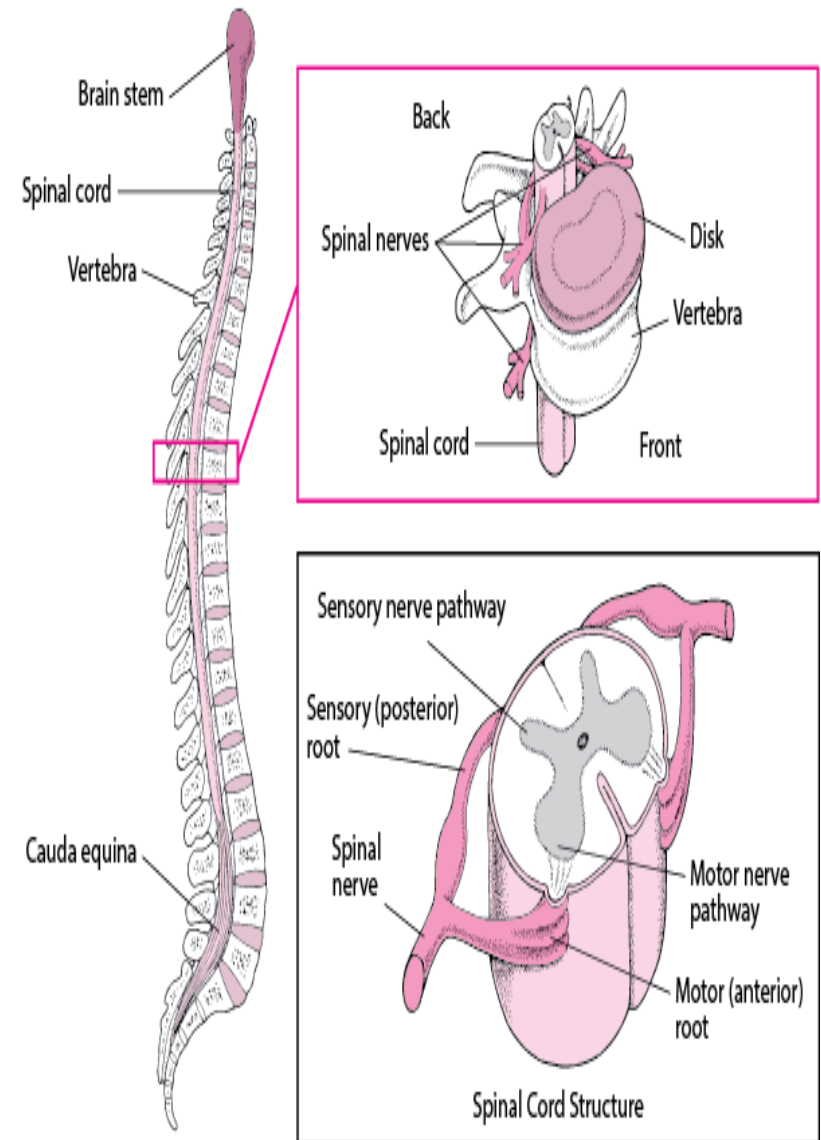
Each segment gives **2** spinal nerves, that leave through Intervertebral foramen of the same level of its spinal segment.

The roots of Lumbosacral nerves gathered inferiorly as group of fibers called ***Cauda equina*** (horse tail).

The spinal cord has **2 enlargements**:

Cervical (C5-T1)

Lumbar (L1-S3)



Internal structure of the spinal cord:

1) Central canal : contains CSF.

2) Grey matter is H-shape & it has

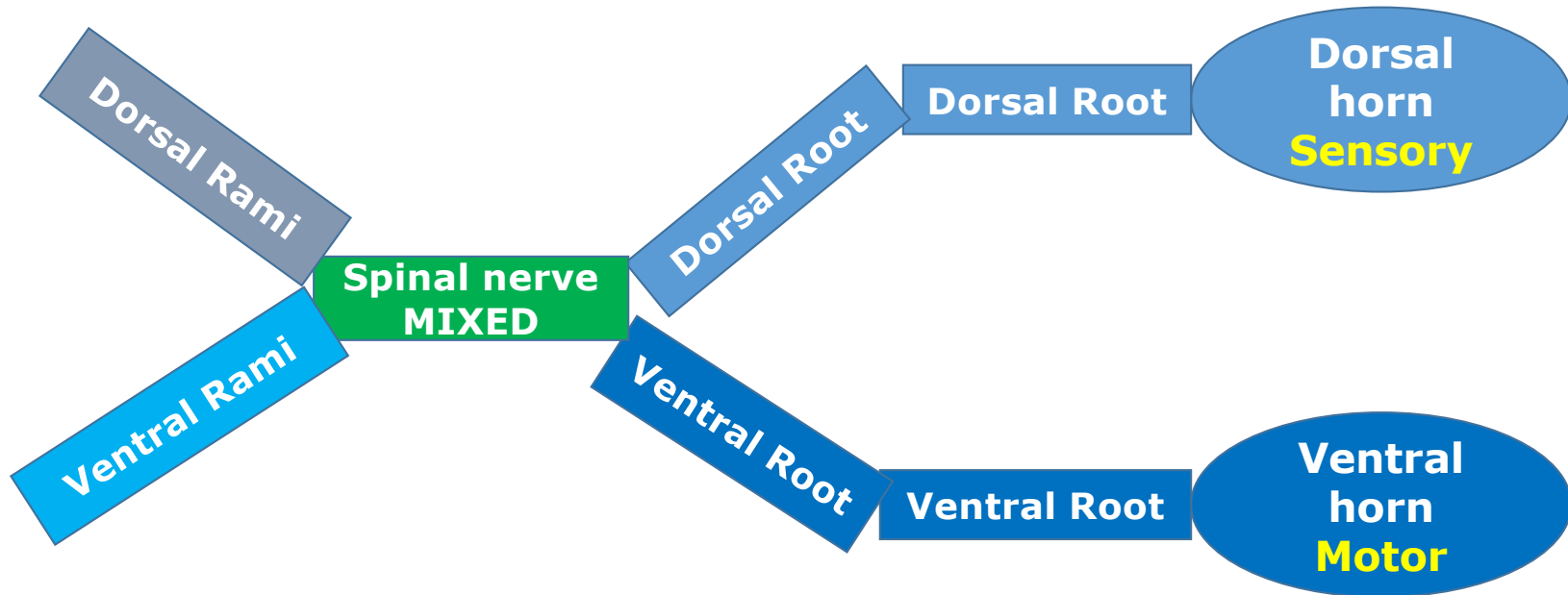
2 ventral horns (contain motor nuclei)

2 dorsal horns (contain **s**ensory nuclei)

2 lateral horns (from T1-L2. that contain sympathetic nuclei).

3) White matter Surrounds the grey matter & is formed of ascending & descending tracts.

It is divided into 3 funiculi; anterior (ventral), lateral & posterior (dorsal).



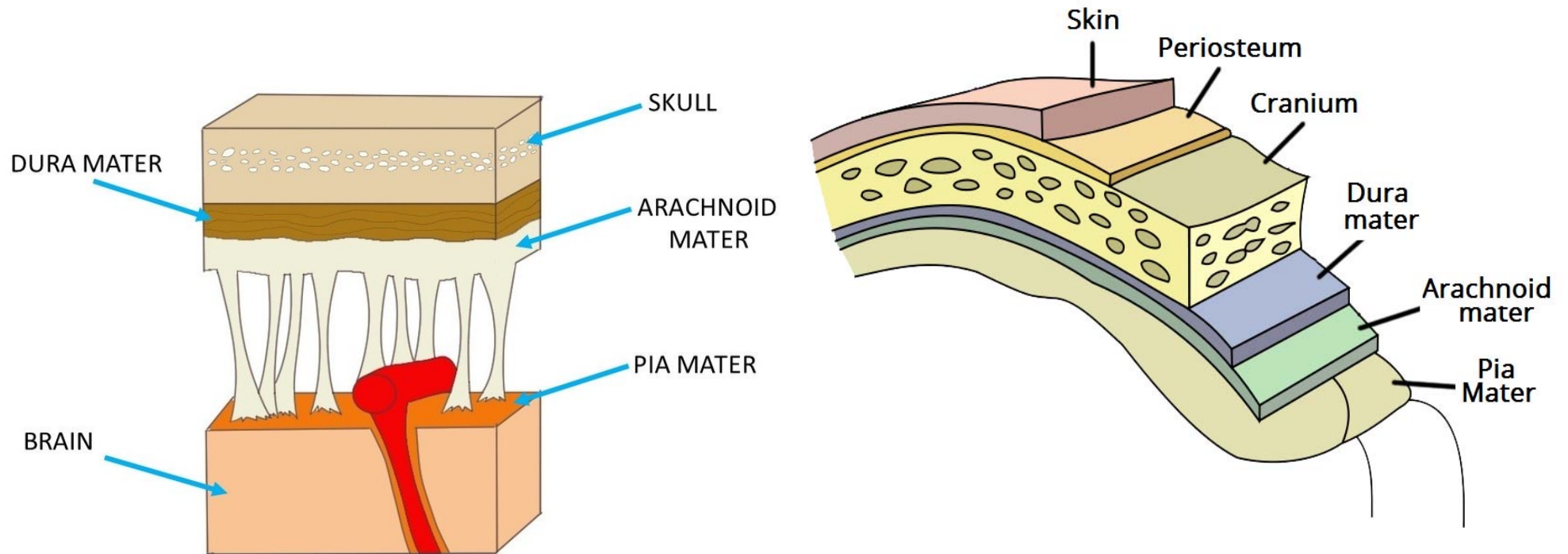
The Meninges

The brain is covered with 3 layers (meninges):

1-Dura (outer layer): Dense layer of fibrous tissue.

2-Arachnoid (middle layer): Delicate CT membrane.

3-Pia (inner layer) : Transparent fibrous membrane that stick on the spinal cord.



Meningeal spaces

Meningeal spaces located between the 3 meninges and the vertebral canal.

Include 3 spaces:

Extradural space

Filled with fat, Connective Tissue and blood vessels.

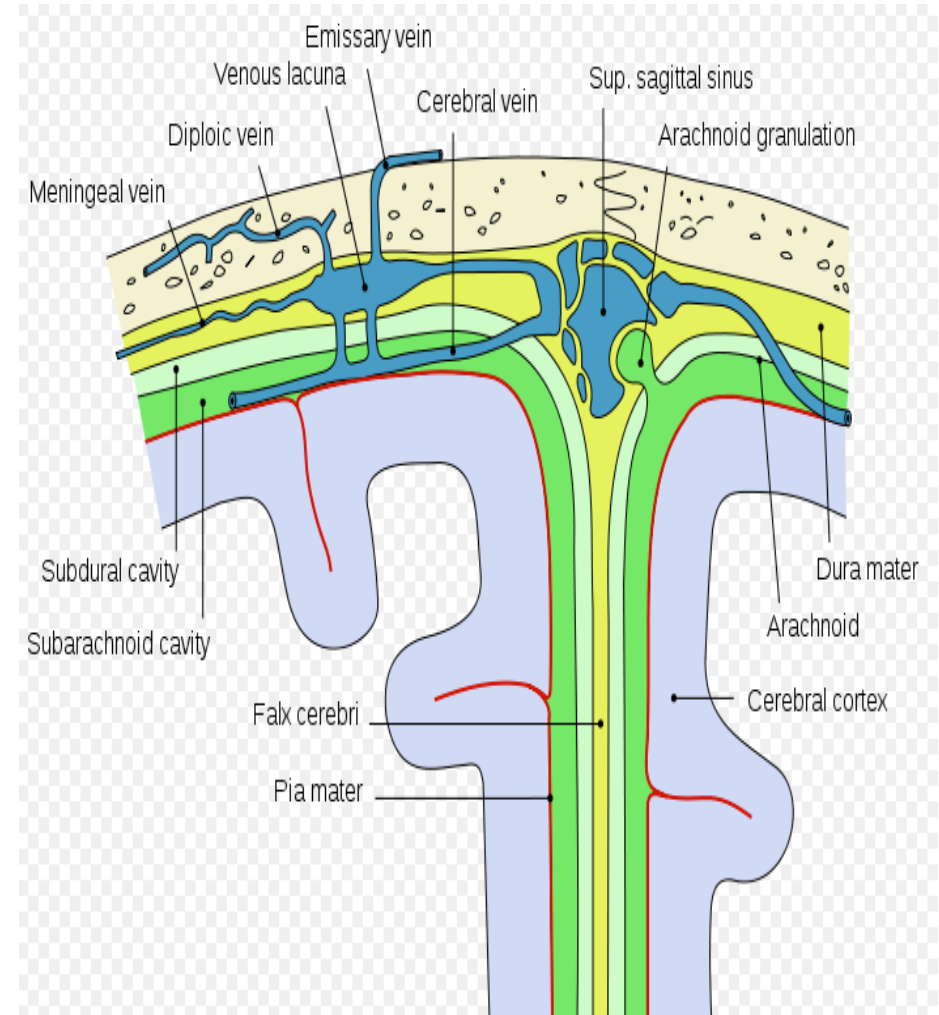
Subdural space

Contains serous fluid.

Subarachnoid space

A wide space that Contains cerebrospinal fluid (CSF)

Extends to lower border of **S2**.



The Cerebrospinal Fluid (CSF)

It is the fluid filling the ventricles & central canals of the CNS .

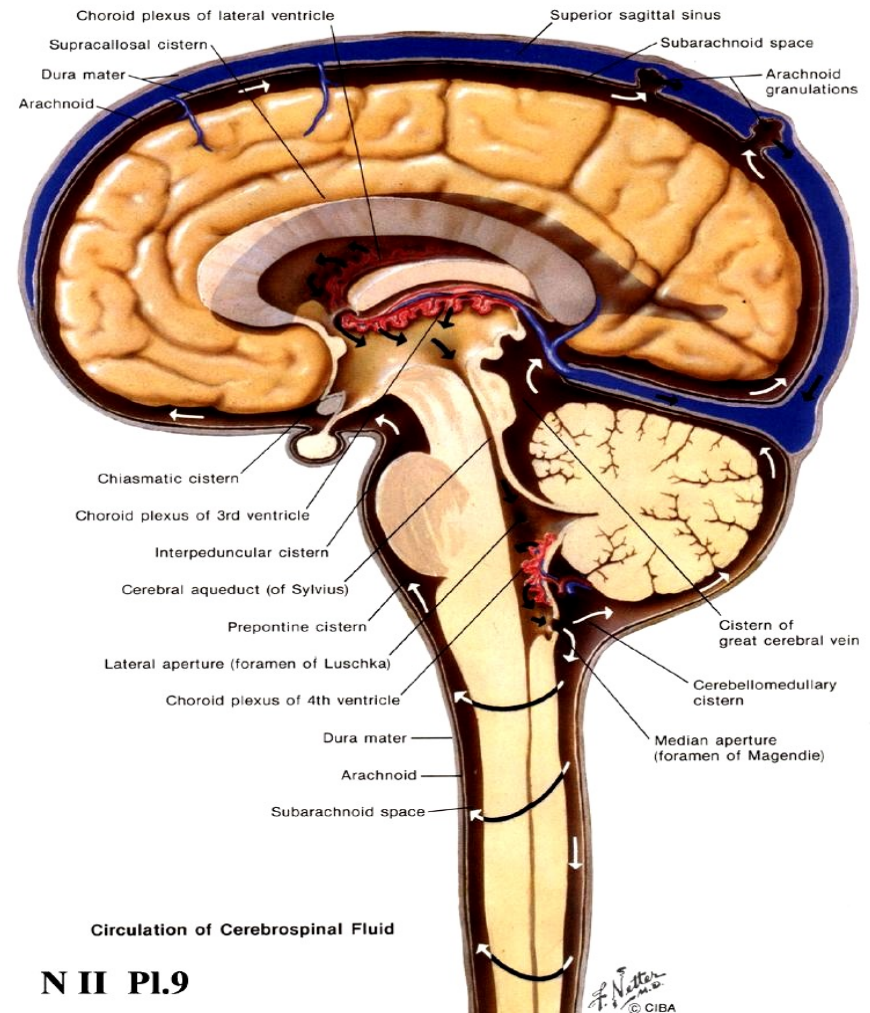
Production of CSF: It is secreted by the **choroid plexuses**

Circulation of CSF: It circulates in the ventricles & central canals of the CNS.

It circulates within subarachnoid space

Absorption of CSF: It is absorbed by **arachnoid villi & granulations** to be excreted into the dural venous sinuses.

Function : It forms a water cushion to protect the brain & spinal cord.



Thank you!

