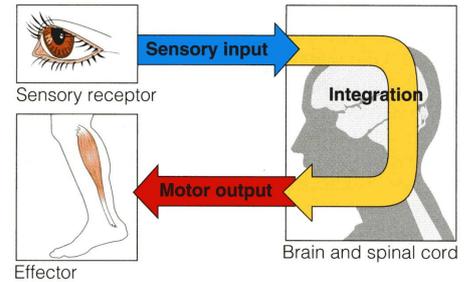


# THE NERVOUS SYSTEM I

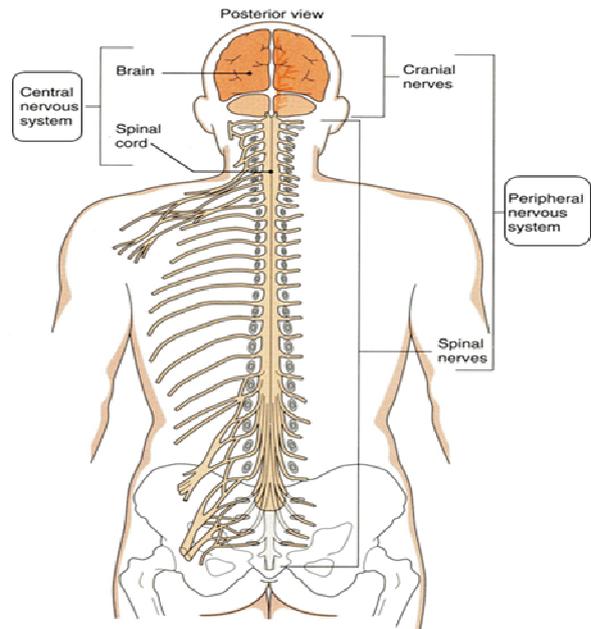
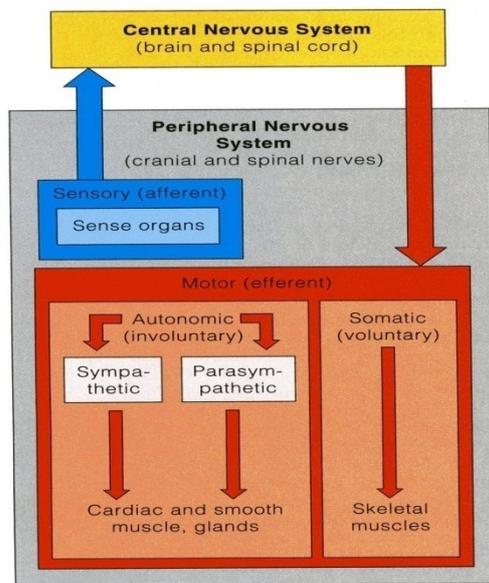
## FUNCTIONS :

- Collection of sensory input → integration → motor output.



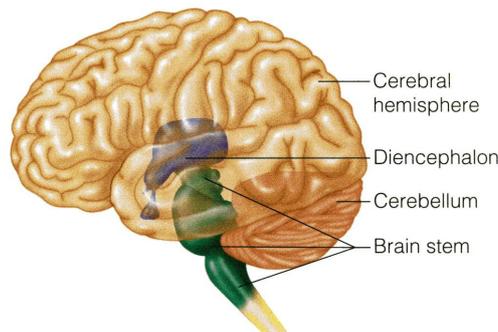
## ORGANIZATION :

- **STRUCTURAL :** CNS + PNS.
- **FUNCTIONAL :**
  - Sensory division.
  - Motor division : autonomic + somatic.



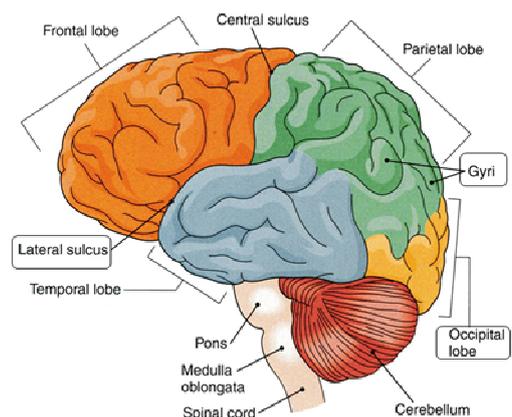
## REGIONS OF THE BRAIN :

- Cerebral hemispheres.
- Diencephalon.
- Cerebellum.
- Brain stem.



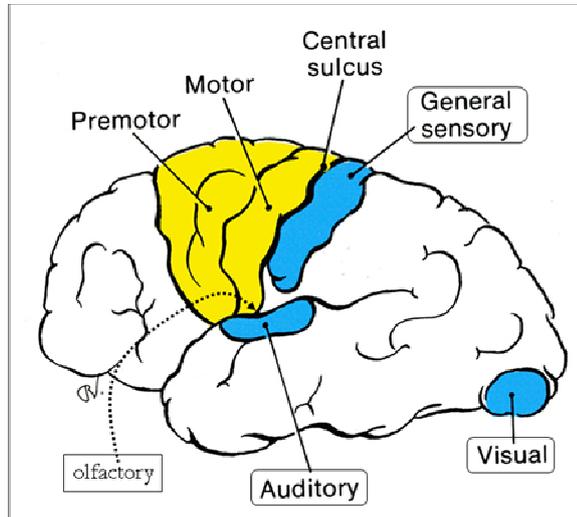
## CEREBRAL HEMISPHERES :

- They are the largest part of the brain.
- They are paired.
- They have ridges of tissue, called **gyri**.
- The gyri are separated by grooves called **sulci**.
- Large regions of the brain are called **lobes**.
- They are separated by deeper grooves called **fissures**.



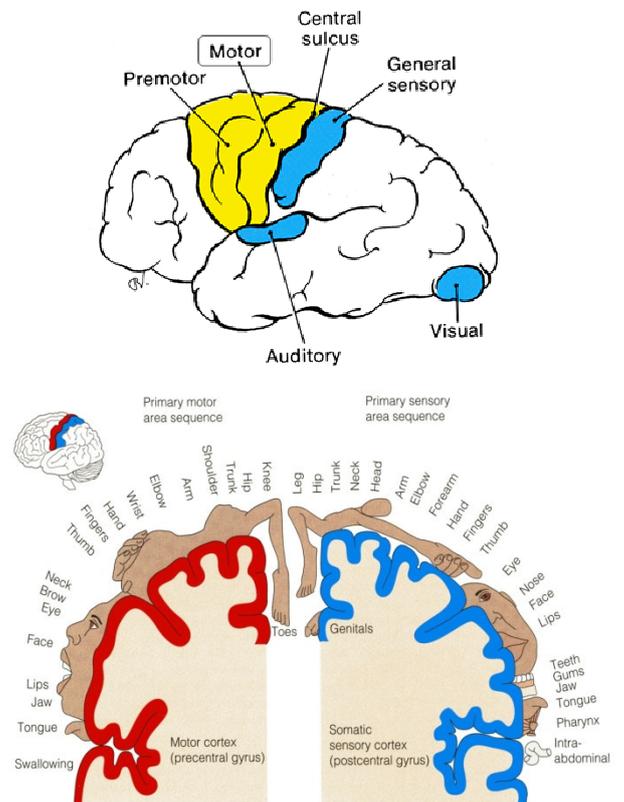
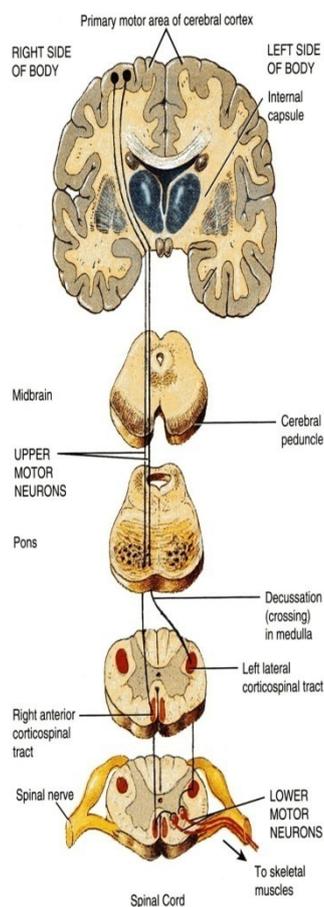
## MAIN SENSORY AREAS OF THE CORTEX :

- The **somatic sensory area** is located in the parietal lobe posterior to the central sulcus.
- **Visual sensations** are received in the visual area in the posterior lobe.
- **Auditory sensations** are received in the temporal lobe close to the lateral sulcus.
- **Olfactory sensations** are received deep inside the temporal lobe.

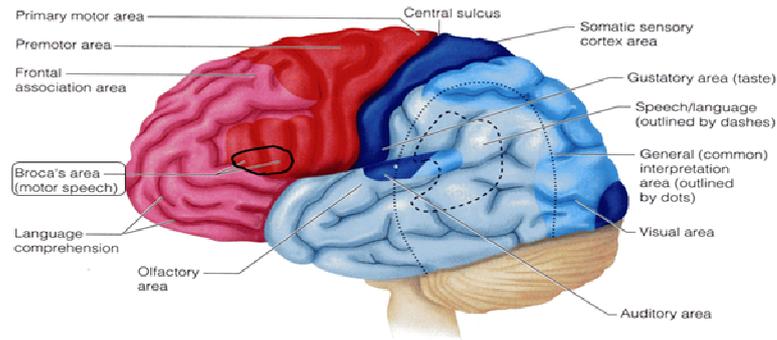


## PRIMARY MOTOR AREA OF THE CORTEX :

- The **primary motor area** is in charge of voluntary movements of skeletal muscles.
- It is located in the frontal lobe, anterior to the central sulcus.
- The body is represented upside down.
- The axons of these neurons form the **pyramidal** (corticospinal tract) which descends in the spinal cord.



## BROCA'S AREA :



- Located at the base of the precentral gyrus, in the left hemisphere.
- Damage to this area causes inability to say words properly.

## AREAS INVOLVED IN SPEECH AND LANGUAGE RECOGNITION :

areas involved in reasoning are located in the anterior part of the frontal lobes.

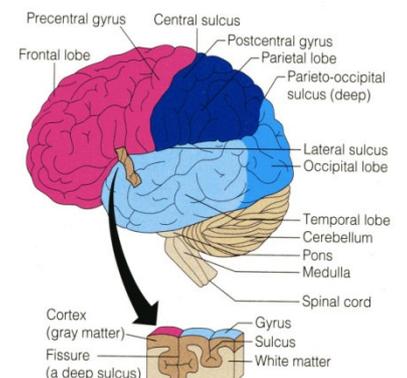
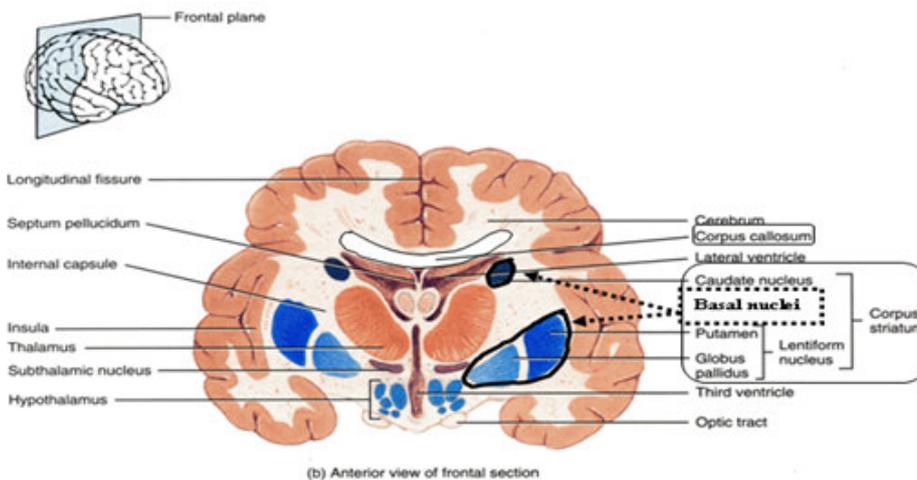
the frontal lobes are also involved in language comprehension.

located at the junction of the temporal, occipital and parietal lobes in one of the two hemispheres.

function: comprehension of words.

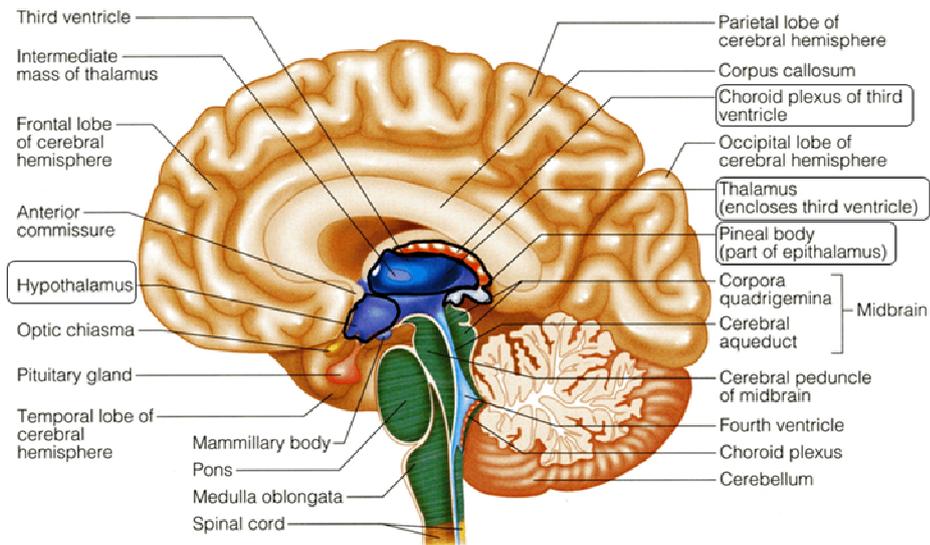
## TISSUE OF THE CEREBRAL HEMISPHERES :

- The outermost layer is called **gray matter** or cortex.
- Deeper is located the white matter, composed of fiber tracts (bundles of nerve fibers), carrying impulses to and from the cortex.
- **Corpus callosum** is a very large fiber tract connecting the cerebral hemispheres.
- The **basal nuclei** are made from gray matter and are located deep within the white matter.
- They help the motor cortex in the regulation of voluntary motor activities.



## DIENCEPHALON :

- The diencephalon is located between the brain hemispheres and is linked to them and to the brainstem.
- The major structures of the diencephalon are the **thalamus**, **hypothalamus** and **epithalamus**.



### • THALAMUS :

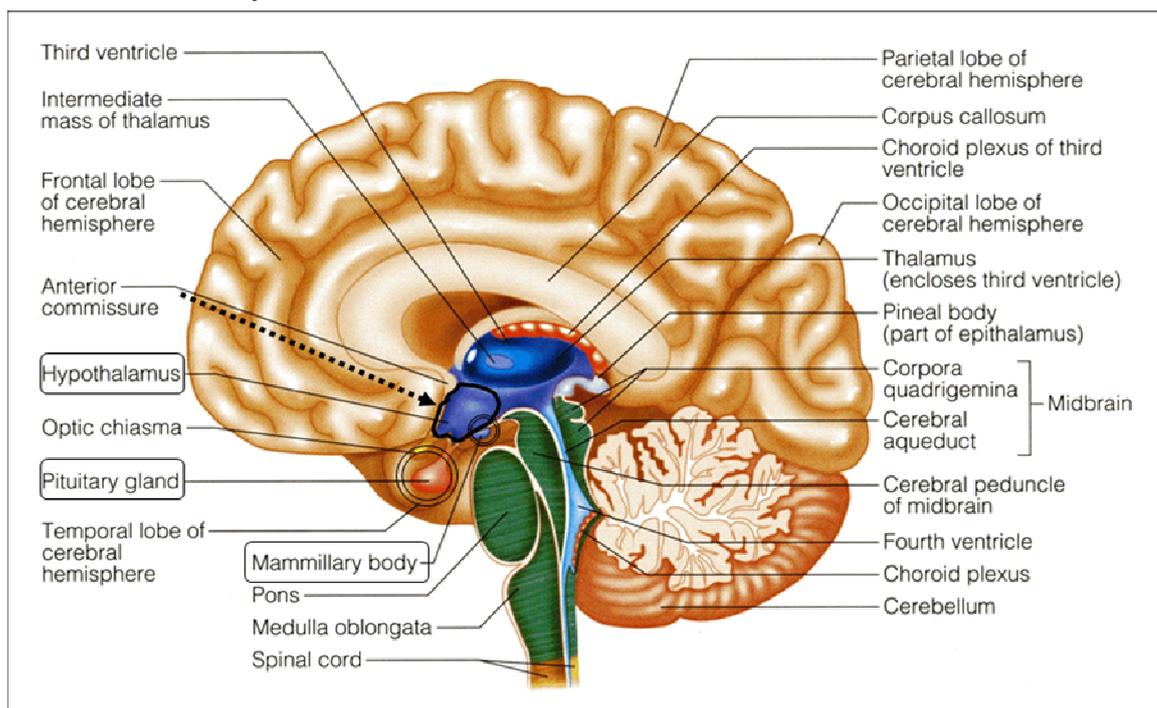
- The thalamus is a relay station for sensory impulses passing upward to the sensory cortex.
- It helps us to recognize if the sensory impulse is pleasant or unpleasant.

### • EPITHALAMUS :

- The epithalamus forms the roof of the 3<sup>rd</sup> ventricle.
- It is made from two parts : the **pineal body** and the **choroid plexus**.
- The choroid plexus produces cerebrospinal fluid.
- The pineal body is part of the endocrine system.

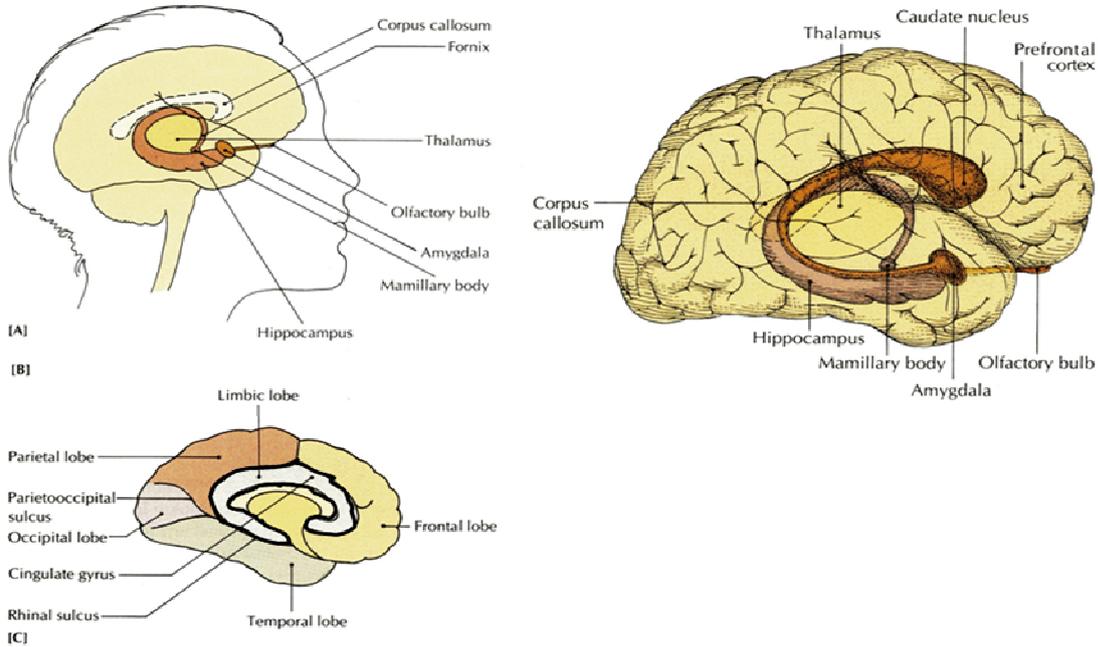
### • HYPOTHALAMUS :

- The hypothalamus is an important center for regulation of the autonomic nervous system.
- It regulates body temperature, water balance and metabolism.
- It is connected to the **pituitary gland**, important for the regulation of the endocrine system, and the **mammillary bodies**, reflex centers involved in olfaction.



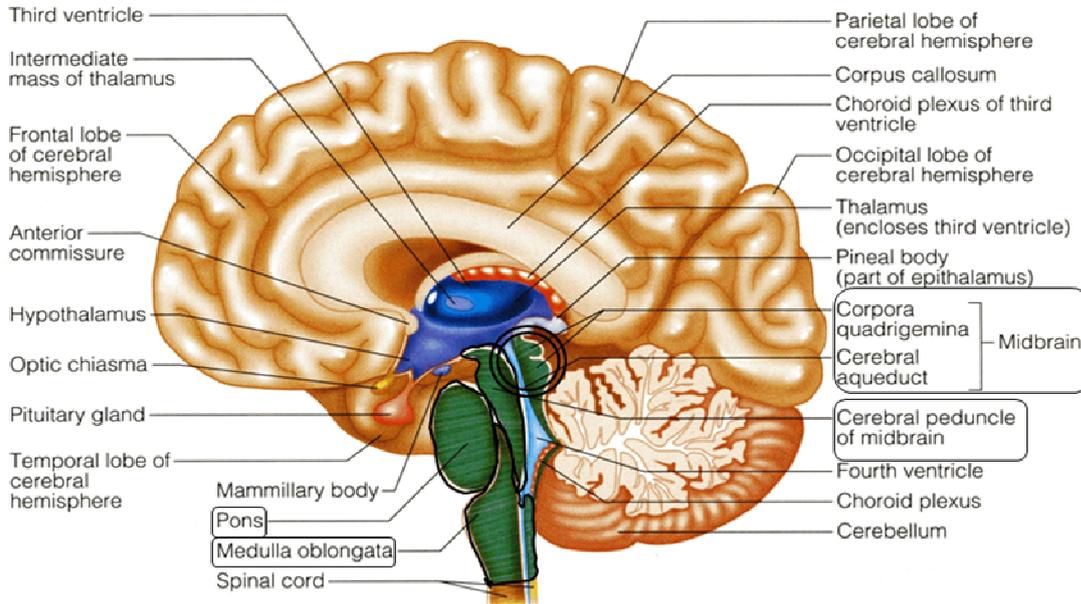
## THE LIMBIC SYSTEM :

- The hypothalamus is an important part of the limbic system, called also "emotional-visceral brain".
- The hypothalamus has centers that regulate thirst, appetite, sex, pain and pleasure.



## BRAIN STEM :

- The brainstem has three parts : **midbrain**, **pons** and **medulla oblongata**.



### • MIDBRAIN :

- The midbrain extends from the mammillary bodies to the pons.
- It has 3 parts : **cerebral aqueduct**, **cerebral peduncles** and **corpora quadrigemina**.
- **Corpora quadrigemina** are reflex centers involved with vision and hearing.
- The cerebral aqueduct is a canal connecting the 3<sup>rd</sup> and the 4<sup>th</sup> ventricle.
- The **cerebral peduncles** are two big fiber tracts which carry ascending and descending impulses.

- **PONS :**

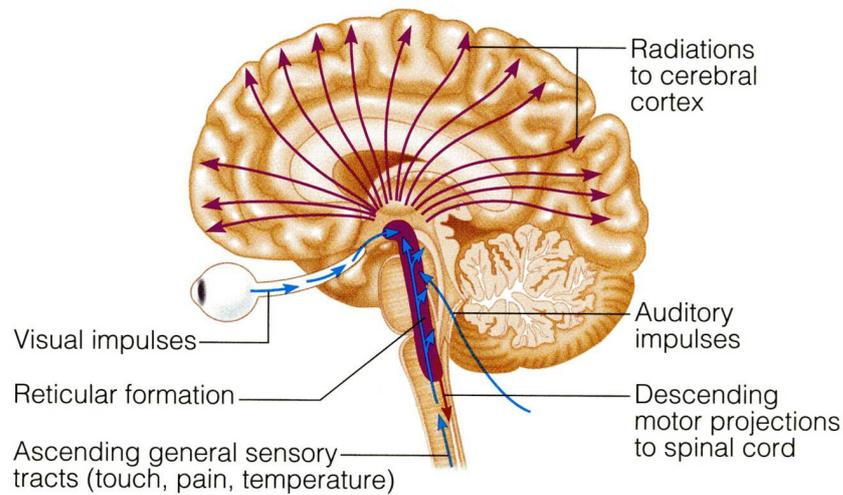
- The **pons** is a rounded part of the midbrain that contains mainly fiber tracts.
- The reflex center regulating breathing is also located there.

- **MEDULLA OBLONGATA :**

- **Medulla oblongata** connects the brain with the spinal cord.
- It contains many fiber tracts and the centers that regulate heart rate, blood pressure, breathing, swallowing and vomiting.

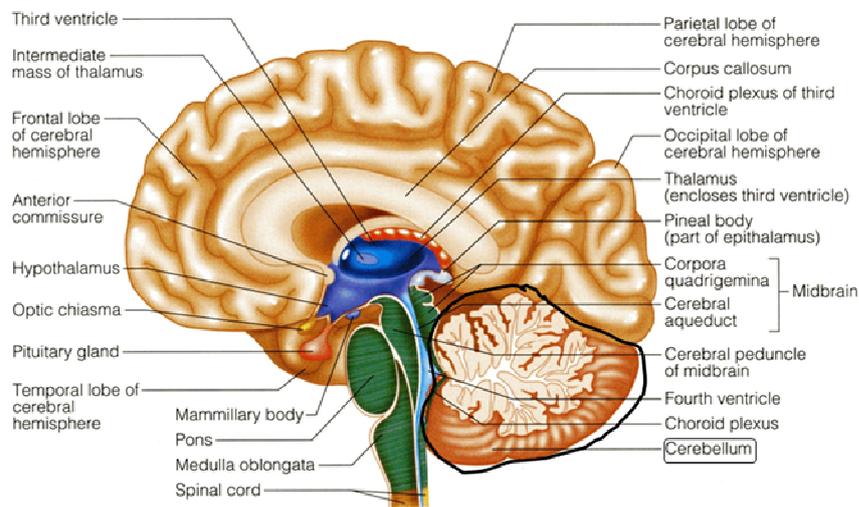
**RETICULAR FORMATION :**

- The **reticular formation** is a column of gray matter extending the entire length of the brain stem.
- It is involved in the motor control of the visceral organs.
- A special group of it's neurons, the **reticular activating system (RAS)** plays a role in consciousness and awake/sleep cycle.
- Damage to RAS area results in permanent coma.



**CEREBELLUM :**

- The **cerebellum** has 2 hemispheres and a convoluted surface.
- It has an outer cortex made from gray matter and an inner region of white matter.
- It provides precise coordination for body movements and helps maintain equilibrium.

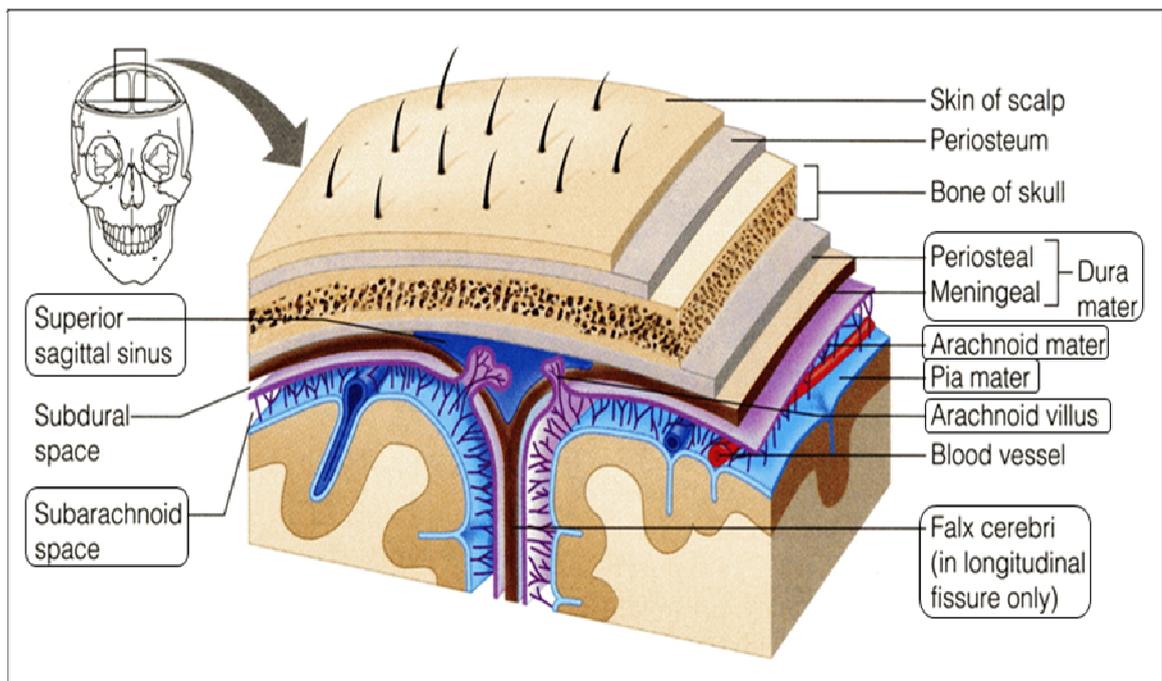


## PROTECTION OF THE CNS :

- The CNS is protected by :
  - The skull and the vertebral column (bone)
  - **Meninges** (membranes)
  - **Cerebrospinal fluid** (watery cushion)
- There are 3 layers of meninges :
  - **Dura mater** (outside membrane).
  - **Arachnoid mater** (middle membrane).
  - **Pia mater** (inner membrane).

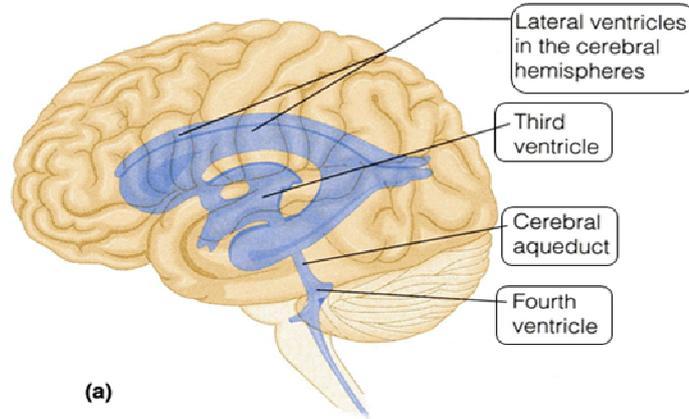
## MENINGES :

- **Dura mater :**
  - Double-layered membrane.
  - The outermost layer is attached to the inside surface of the skull bones (**periosteal layer**).
  - The internal layer (**meningeal layer**) covers the surface of the brain and the spinal cord.
  - The two layers are fused together, except in 3 places where they form channels (**dural sinuses**) where venous blood from the brain is collected.
  - In some places the inner dural membrane forms folds (**falx cerebri**) that attaches the brain to the cranial cavity.
- **Arachnoid mater :**
  - Looks like cobweb.
  - Has threadlike extensions (**arachnoid villi**) that attach it to the innermost membrane (pia mater).
  - The arachnoid villi absorb cerebrospinal fluid.
  - Contains the **subarachnoid space** filled with cerebrospinal fluid.
- **Pia mater :**
  - Thin, delicate membrane.
  - Attached to the surface of the brain.



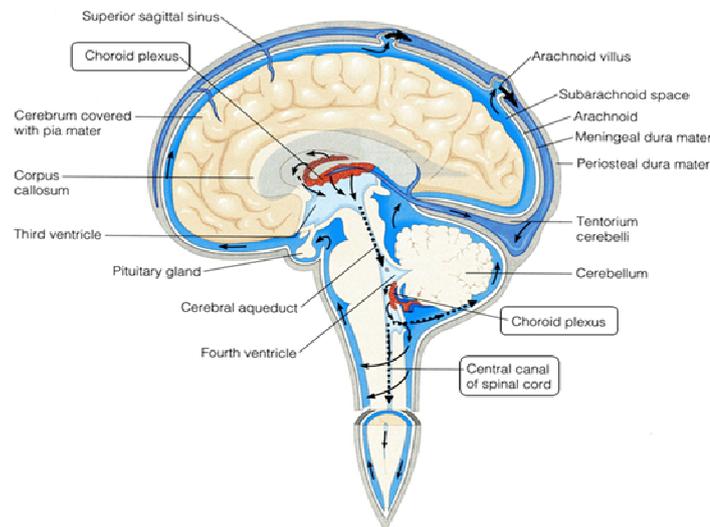
## BRAIN VENTRICLES :

- The brain is bathed by the cerebrospinal fluid (CSF).
- Inside the brain, there are spaces (**ventricles**) filled with CSF.
- There are 4 ventricles.
- The 2 **lateral ventricles** are in the brain hemispheres .
- The **3<sup>rd</sup> ventricle** is in the diencephalon .
- The **4<sup>th</sup> ventricle** is between the pons and the cerebellum.
- The **cerebral aqueduct** connects the 3<sup>rd</sup> to the 4<sup>th</sup> ventricle.



## CEREBROSPINAL FLUID :

- CSF is constantly produced by the choroid plexuses inside each ventricle.
- Inside the brain, CSF flows from the lateral ventricles in the 3<sup>rd</sup> and 4<sup>th</sup> ventricle.
- From the 4<sup>th</sup> ventricle, part of the CSF flows down in the central canal of the spinal cord.
- Most of the CSF drains from the 4<sup>th</sup> ventricle in the subarachnoid space around the brain and returns to the dural sinuses through the arachnoid villi.



# THE END

LoveTomy Team 426  
Team leader : Dr. hams  
Done by : Omar Bin Husain

## SELF QUIZ

**1- The cerebral, all are true, EXCEPT :**

- a. They are the largest part of the brain.
- b. Visual sensations are received in the visual area in the frontal lobe.
- c. They have ridges of tissue, called gyri.
- d. It is divided into 4 lobes.
- e. The gyri are separated by grooves called sulci.

**2- All the following are part of the brain, EXCEPT :**

- a. Cerebral hemispheres.
- b. Cerebellum.
- c. Diencephalon.
- d. First two cranial nerves.
- e. Brain stem.

**3- Regarding the CNS, all the statements are true, EXCEPT :**

- a. Is protected by bones, meninges, and cerebrospinal fluid.
- b. There are 3 layers of meninges : dura, arachnoid, and pia mater.
- c. It is composed from brain and spinal cord.
- d. Cranial nerves are part of CNS.
- e. Pia mater is nearest layer to the brain.

**4- True statements about the CEREBELLUM include all the following, EXCEPT :**

- a. Has 2 hemispheres and a convoluted surface.
- b. It has an outer cortex made from gray matter and an inner region of white matter.
- c. The cerebellum has three parts : midbrain, pons and medulla oblongata.
- d. It provides precise coordination for body movements.
- e. It helps maintain equilibrium.

1. b	2. d	3. d	4. c
------	------	------	------

## MATCHING

- |                             |                                    |
|-----------------------------|------------------------------------|
| a. The somatic sensory area | 1. In the frontal lobe             |
| b. Visual sensations        | 2. Inside the temporal lobe        |
| c. Auditory sensations      | 3. In the occipital lobe           |
| d. Olfactory sensations     | 4. Is located in the parietal lobe |
| e. The primary motor area   | 5. Close to the lateral sulcus     |

a. 4	b. 3	c. 5	d. 2	e. 1
------	------	------	------	------