

# **HUMAN ANATOMY AND PHYSIOLOGY-II**

## **Central nervous system**

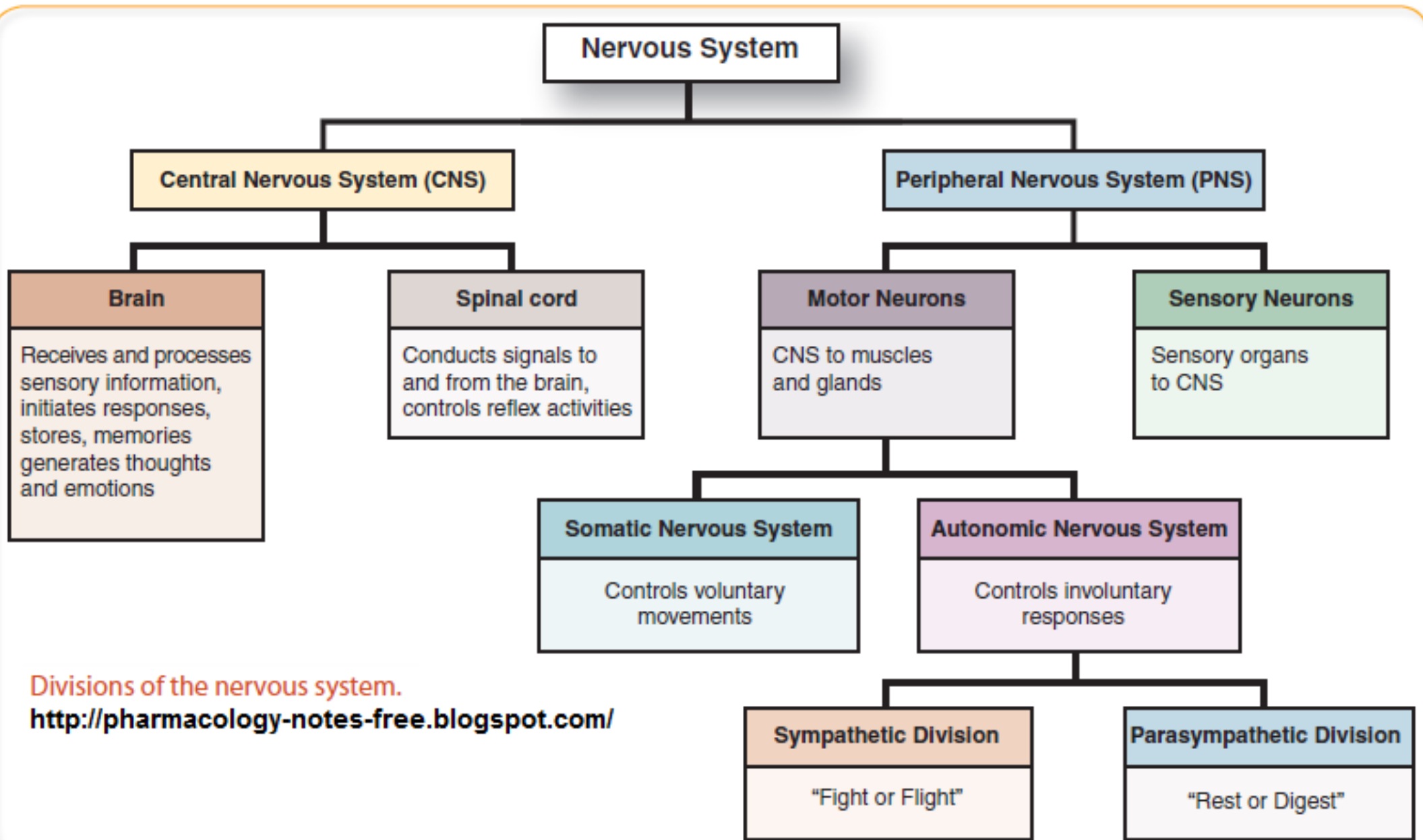
**Structure and functions of brain (cerebrum, brain stem, cerebellum)**



**Centurion**  
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*Shaping Lives...*  
*Empowering Communities...*

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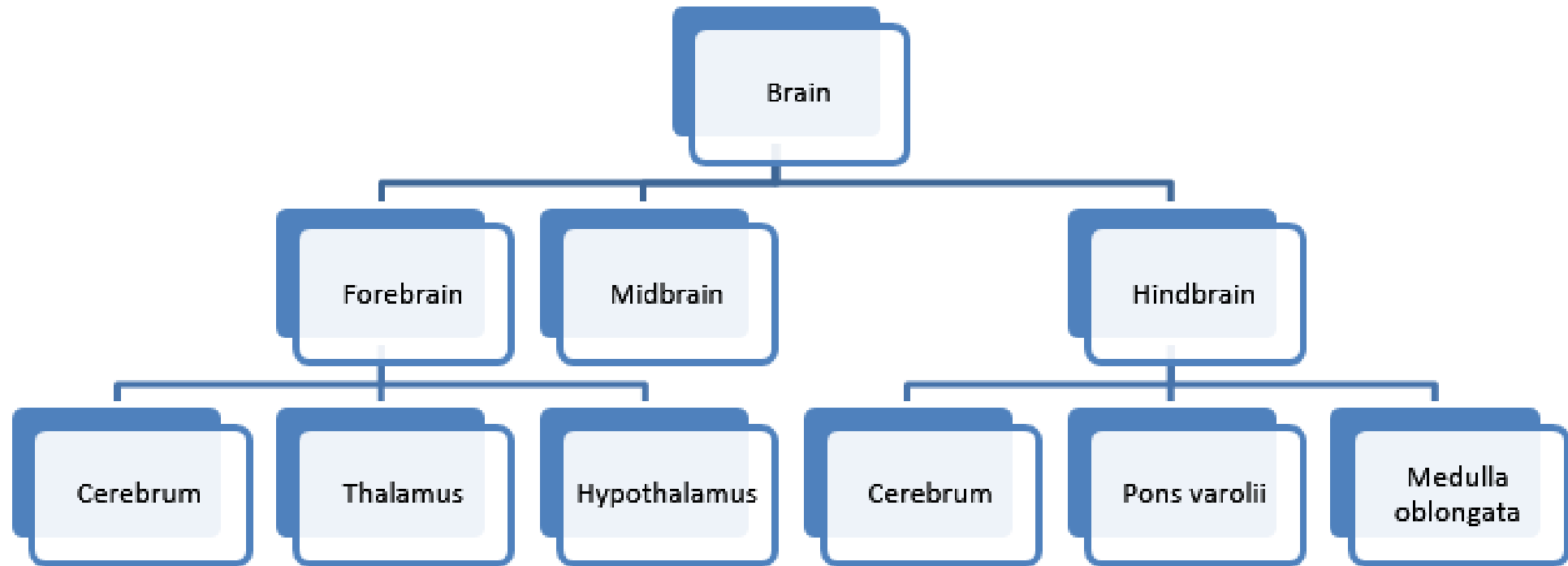


Divisions of the nervous system.  
<http://pharmacology-notes-free.blogspot.com/>

# Brain:

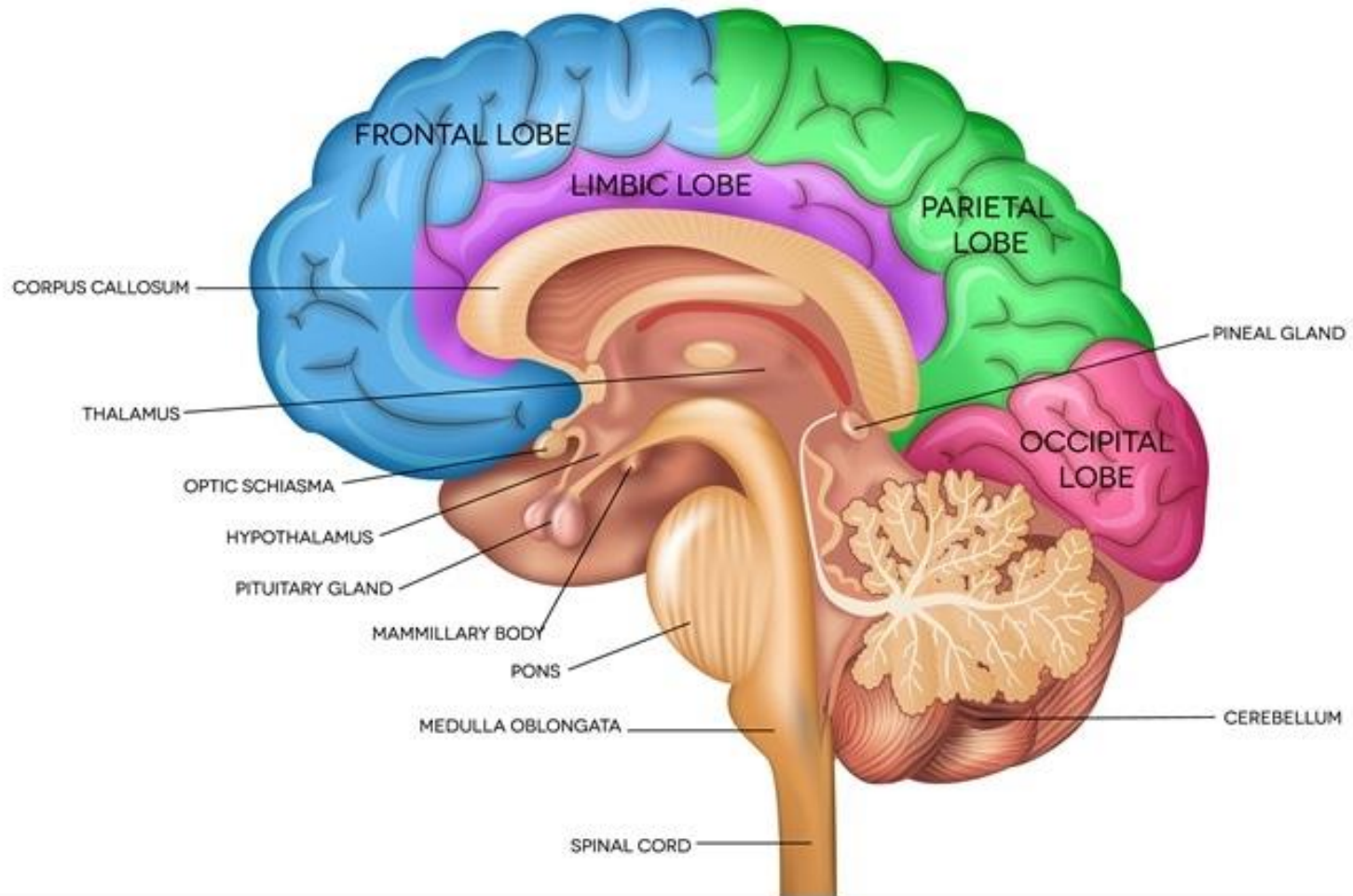
- Brain is an organ of soft nervous system(tissue) contained in the skull of vertebrates, functioning as the coordinating centre of the body
- The brain is one of the largest organ of body constitutes about one-fiftieth of the body weight and lies within the cranial cavity.
- It is the center for all thought, memory, judgement and emotions
- Each part of brain is responsible for controlling different body functions such as temperature regulation and breathing etc.
- It is weighed around 1300-1400 gm and made up of 1000 billions neuron, surrounded by glial cell

# PARTS OF BRAIN





# ANATOMY OF THE BRAIN



# CEREBRUM:

- largest part of the brain and it occupies the anterior and middle cranial fossae
- divided by a deep cleft, the longitudinal cerebral fissure, into right and left cerebral hemispheres, each containing one of the lateral ventricles.
- Deep within the brain the hemispheres are connected by a mass of white matter (nerve fibres) called the corpus callosum.
- The superficial (peripheral) part of the cerebrum is composed of nerve cell bodies or grey matter, forming the cerebral cortex, and the deeper layers consist of nerve fibres or white matter.
- The cerebral cortex shows many infoldings or furrows of varying depth.
- The exposed areas of the folds are the gyri (convolutions) and these are separated by sulci (fissures).
- These convolutions greatly increase the surface area of the cerebrum

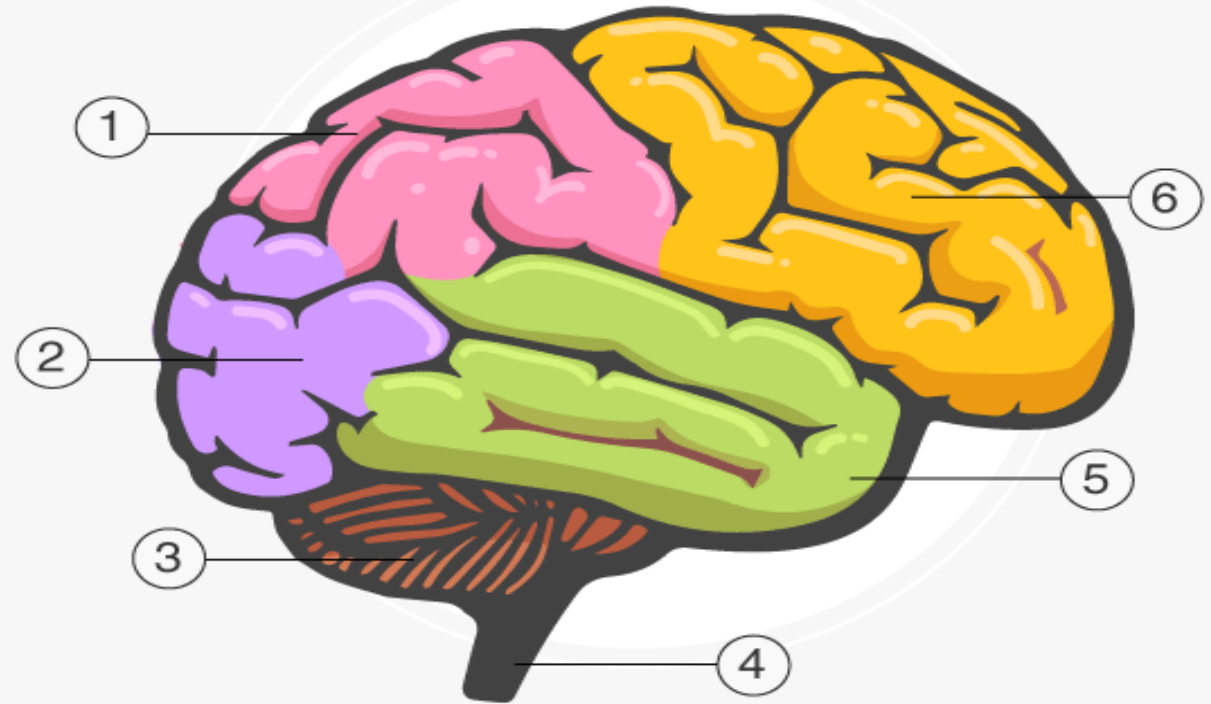
Each hemisphere of the cerebrum is divided into lobes which take the names of the bones of the cranium under

✓ **LEFT**

*hemisphere  
control right  
side of body*

✓ **RIGHT**

*hemisphere  
control left  
side of body*



- |                 |                  |                |
|-----------------|------------------|----------------|
| 1 Parietal Lobe | 2 Occipital Lobe | 3 Cerebellum   |
| 4 Spinal Cord   | 5 Temporal Lobe  | 6 Frontal Lobe |

# Parts of the Brain

## The Cerebrum: Frontal Lobe

Personality, thinking, planning, problem solving.

## The Cerebrum: Temporal Lobe

Controls speech and hearing.

**The Brain Stem:** Controls all the automatic things, such as circulation.

## Spinal Cord:

Links the brain to the rest of the body.

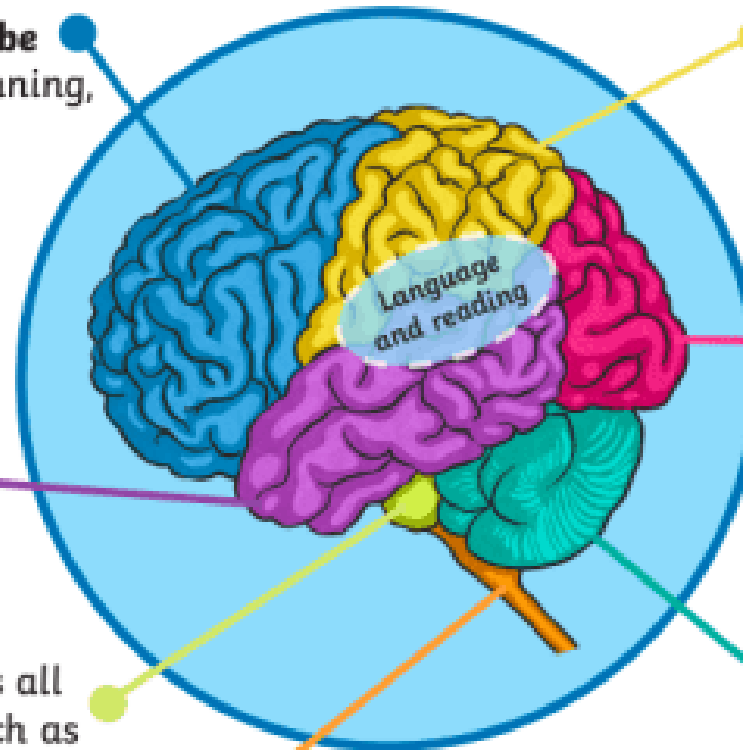
## The Cerebrum: Parietal Lobe

Controls movement, sensations (pain, taste, touch, etc.), speed and writing.

## The Cerebrum: Occipital Lobe

Controls memory, sight and smell.

**The Cerebellum:** Controls movement, balance and muscles.





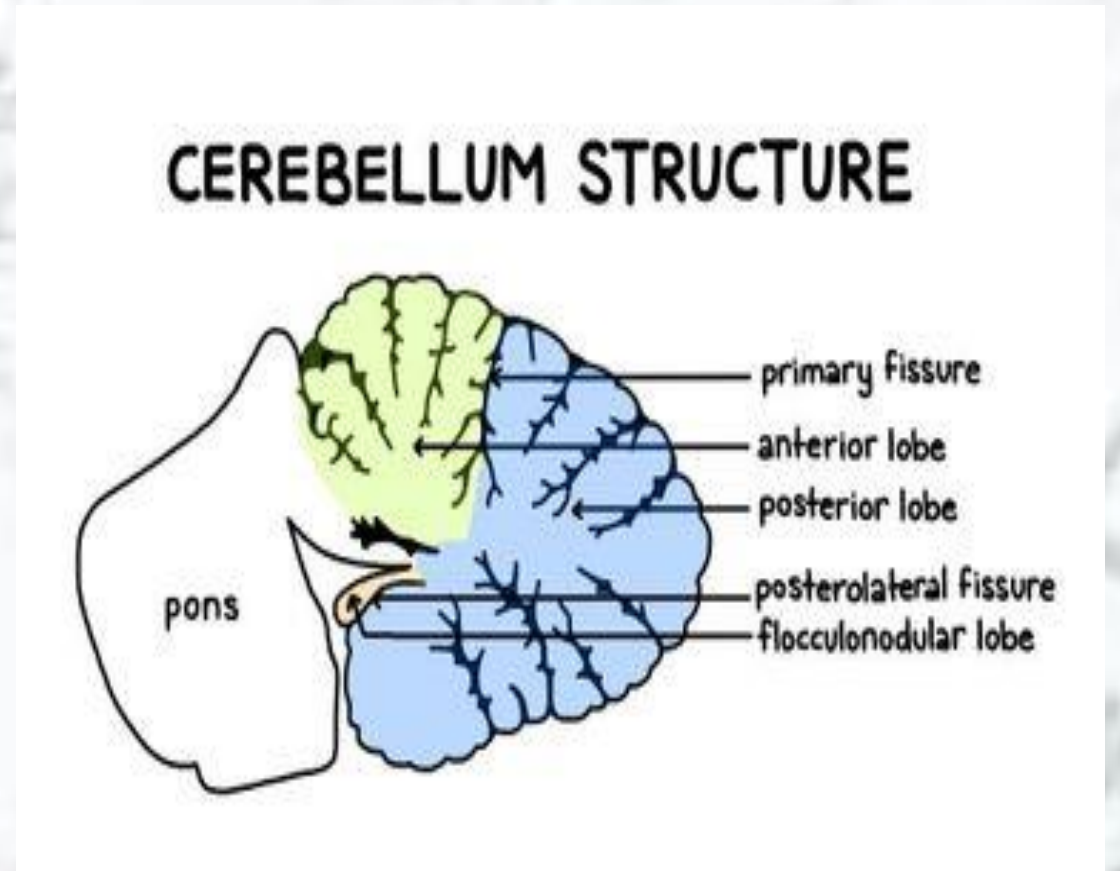
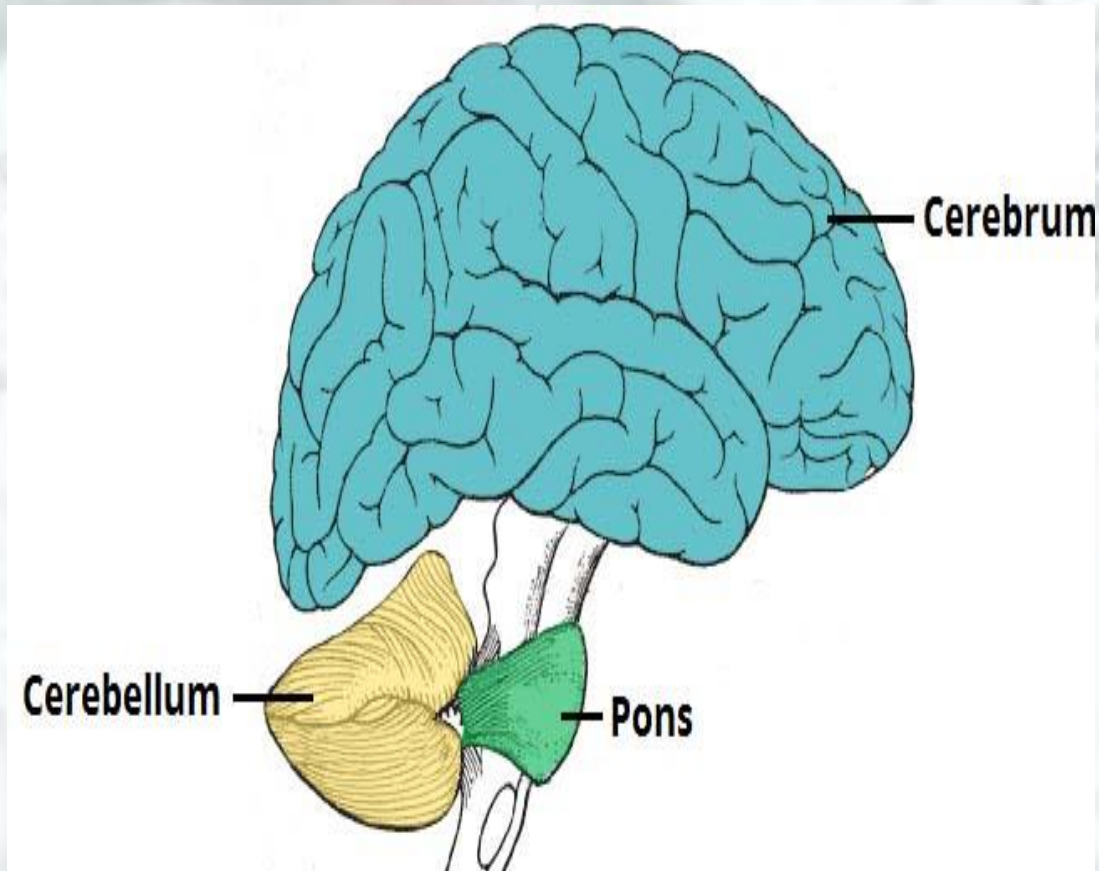
# Function of cerebrum

- Motor function like control of voluntary movement
- Sensory function like perception of pain, temperature, touch pressure, hearing , taste and smell
- Control of intelligence, speech, memory and learning

# Cerebellum

- 2<sup>nd</sup> largest portion of the brain
- Located beneath the posterior part of the cerebrum
- A deep groove known as “transverse fissure” separates cerebrum to cerebellum
- Aids in coordinating voluntary body movements and maintain balance and equilibrium

# Structure



- The external surface called as cerebellar cortex, look like butterfly and largest wings or lobes called cerebellar hemisphere that is interconnect by a narrow portion called vermis.
- It contains 10% weight of entire brain and 50% of neurons
- Types of lobe
  - I. Anterior lobe
  - II. Posterior lobe
  - III. Flocculonodular lobe on inferior surface maintain equilibrium of balance .



- It coordinates skeletal muscles to produce smooth, graceful motions.
- The cerebellum receives information from our eyes, ears, muscles, and joints about what position our body is currently in (proprioception).
- It also receives output from the cerebral cortex about where these parts should be.
- After processing this information, the cerebellum sends motor impulses from the brainstem to the skeletal muscles.

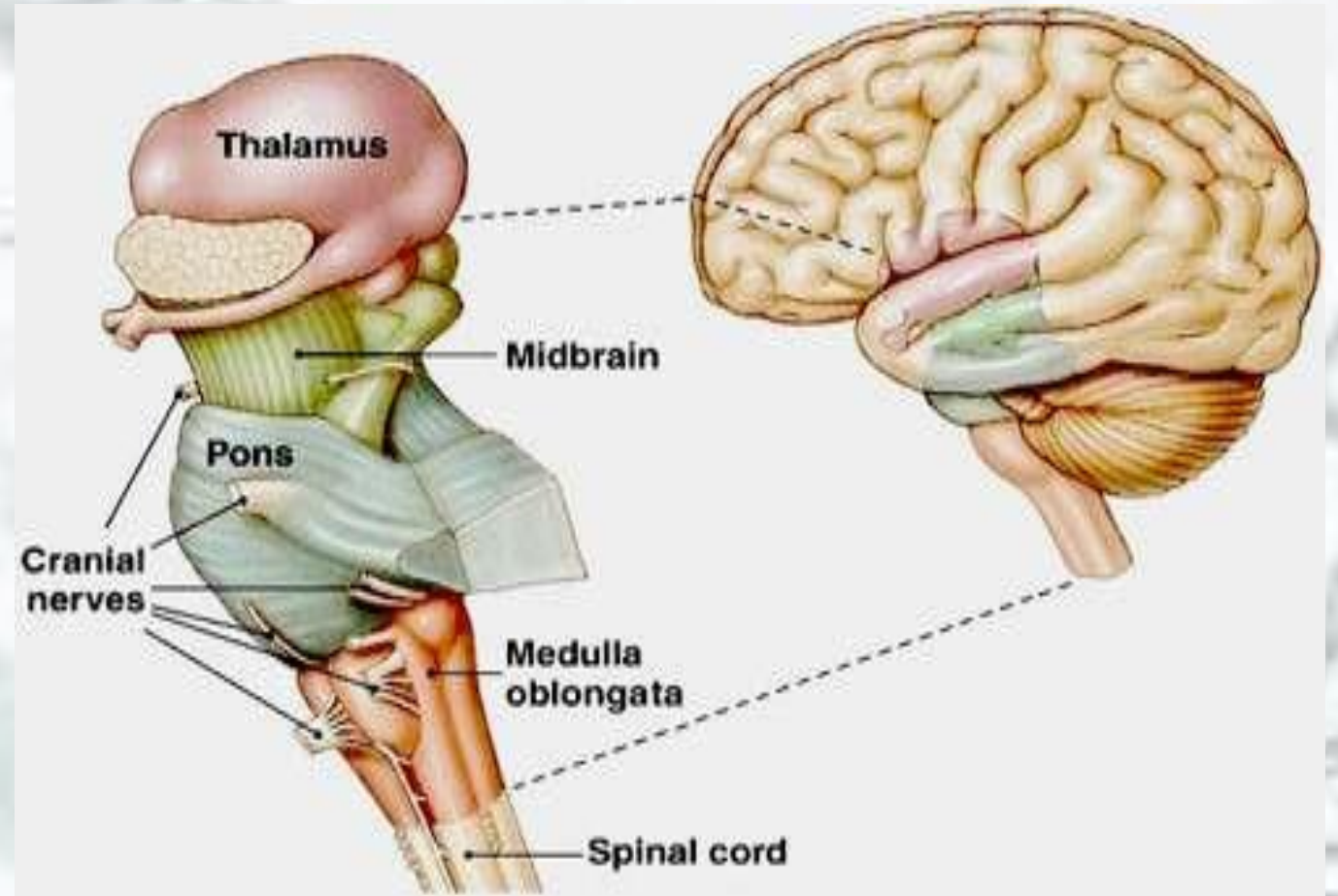
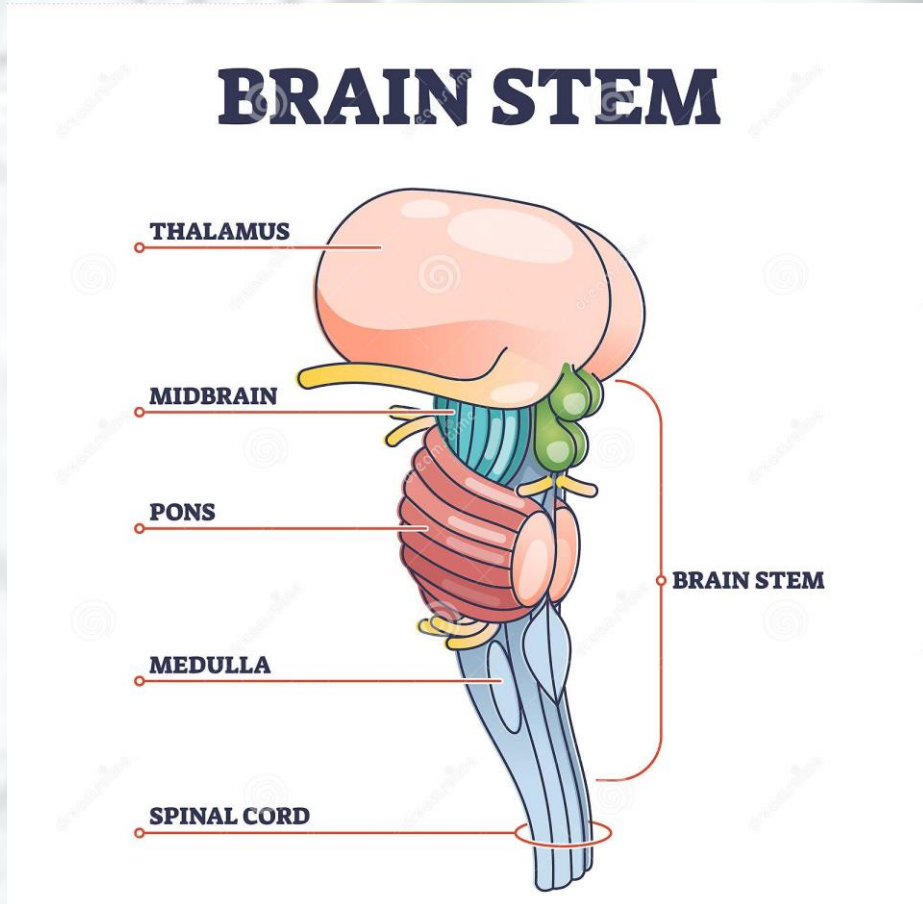
# **Function:**

- The main function of the cerebellum is coordination.
- The cerebellum is also responsible for balance and posture.
- It also assists us when we are learning a new motor skill, such as playing a sport or musical instrument.
- Recent research shows that apart from motor functions cerebellum also has some emotional role

# Brain stem:

It consists of midbrain, pons and medulla oblongata

Superiorly continuous with diencephalon and internally continue with spinal cord





- **Midbrain**

- The midbrain is the area of the brain situated around the cerebral aqueduct between the cerebrum above and the pons below.
- It consists of nuclei and nerve fibres (tracts), which connect the cerebrum with lower parts of the brain and with the spinal cord.
- The nuclei act as relay stations for the ascending and descending nerve fibres.

- **Pons**

- The pons is situated in front of the cerebellum, below the midbrain and above the medulla oblongata.
- It consists mainly of nerve fibres (white matter) that form a bridge between the two hemispheres of the cerebellum, and of fibres passing between the higher levels of the brain and the spinal cord.



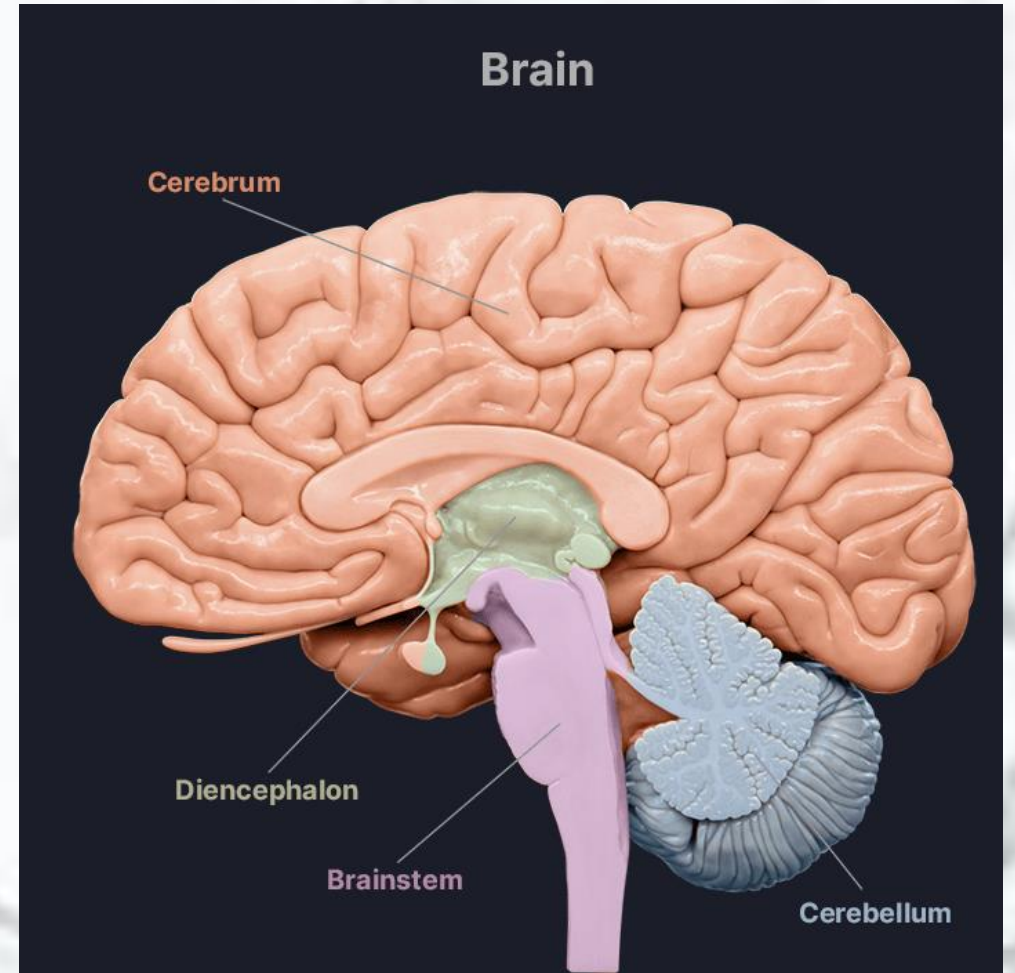
- There are nuclei within the pons that act as relay stations and some of these are associated with the cranial nerves.
- Others form the pneumotaxic and apnoustic centres that operate in conjunction with the respiratory centre in the medulla oblongata.
- The anatomical structure of the pons differs from that of the cerebrum in that the cell bodies (grey matter) lie deeply and the nerve fibres are on the surface.

# Medulla oblongata

- simply the medulla, extends from the pons above and is continuous with the spinal cord below.
- 2.5 cm long and it lies just within the cranium above the foramen magnum.
- Its anterior and posterior surfaces are marked by central fissures
- The outer aspect is composed of white matter, which passes between the brain and the spinal cord, and grey matter, which lies centrally.
- Some cells constitute relay stations for sensory nerves passing from the spinal cord to the cerebrum.
- The vital centres, consisting of groups of cell bodies (nuclei) associated with autonomic reflex activity, lie in its deeper structure.
- These are the: cardiovascular centre respiratory centre reflex centres of vomiting, coughing, sneezing and swallowing.

# Diencephalon

- This part of the brain connects the cerebrum and the midbrain
- It consists of several structures situated around the third ventricle, the main ones being the thalamus and hypothalamus, which are considered here.
- The pineal gland and the optic chiasma are situated there.

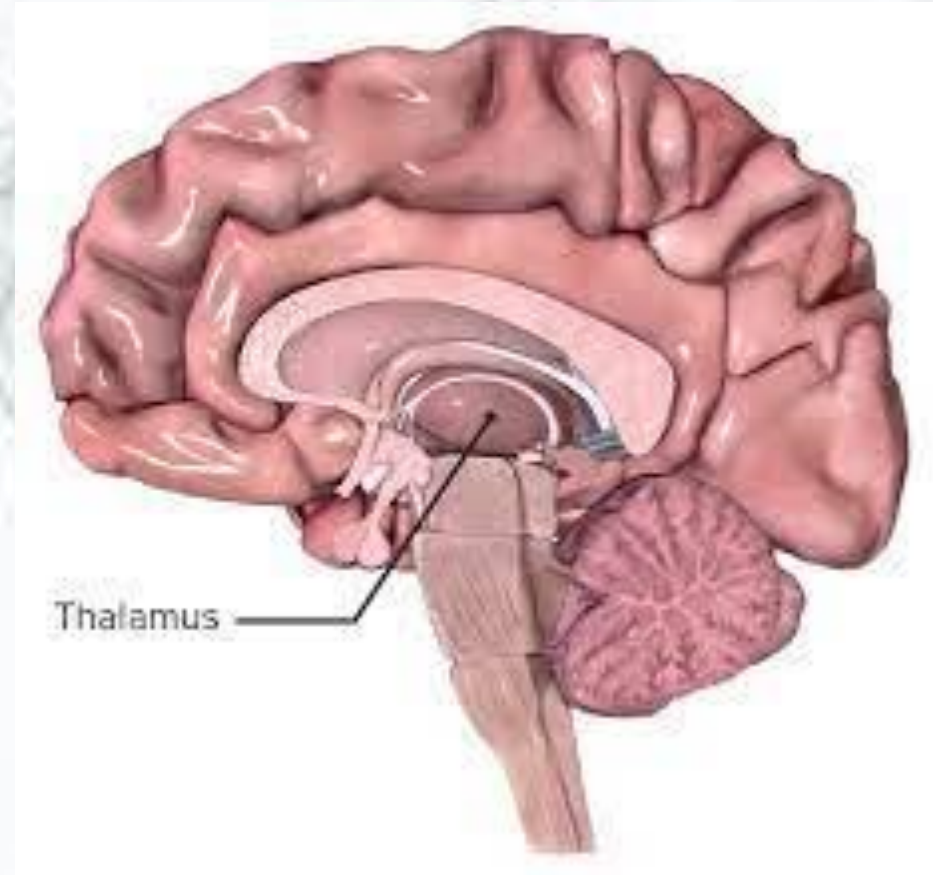
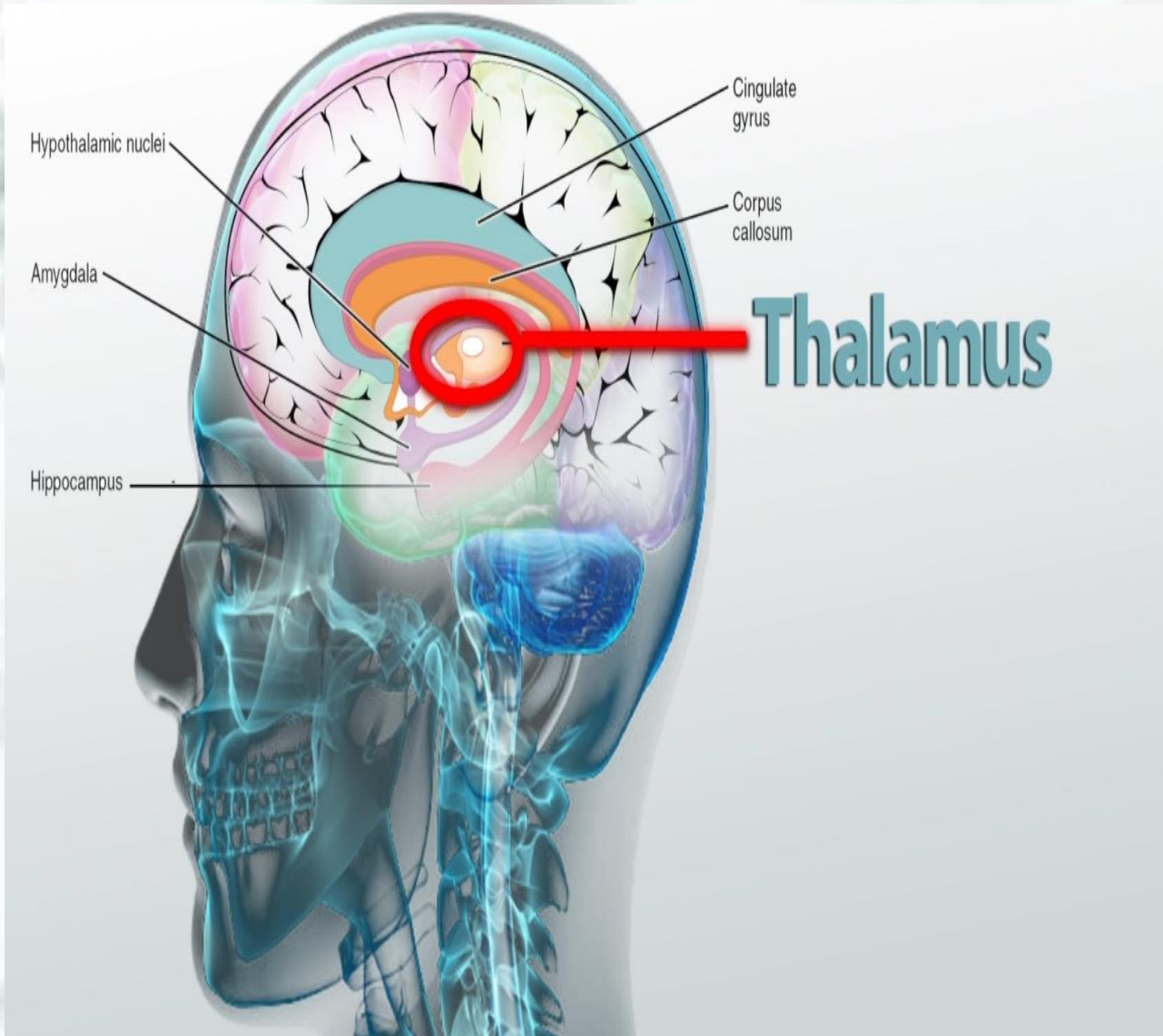




## • **Thalamus**

- consists of two masses of grey and white matter situated within the cerebral hemispheres just below the corpus callosum, one on each side of the third ventricle
- Sensory receptors in the skin and viscera send information about touch, pain and temperature, and input from the special sense organs travels to the thalamus where there is recognition, although only in a basic form, as refined perception also involves other parts of the brain.
- It is thought to be involved in the processing of some emotions and complex reflexes. The thalamus relays and redistributes impulses from most parts of the brain to the cerebral cortex.





## • **Hypothalamus**

- The hypothalamus is a small but important structure which weighs around 7 g and consists of a number of nuclei.
- It is situated below and in front of the thalamus, immediately above the pituitary gland.
- The hypothalamus is linked to the posterior lobe of the pituitary gland by nerve fibres and to the anterior lobe by a complex system of blood vessels.
- Through these connections, the hypothalamus controls the output of hormones from both lobes of the pituitary gland

- Other functions of the hypothalamus include control of:
- the autonomic nervous system
- appetite and satiety
- thirst and water balance
- body temperature
- emotional reactions, e.g. pleasure, fear, rage sexual behaviour and child rearing s
- leeping and waking cycles.



## • THE CEREBRAL HEMISPHERE

- The largest region of the human brain consists of --The cerebral cortex – The underlying white matter – Three deep -lying structures – The basal ganglia, the amygdala, and the hippocampus
- Concerned with perceptual, motor, and cognitive functions, including memory and emotion.
- The two hemispheres - interconnected by the corpus callosum
- The amygdala - concerned with social behavior and emotion,
- The hippocampus -memory
- The basal ganglia - with the control of fine movement.





**THANK YOU**