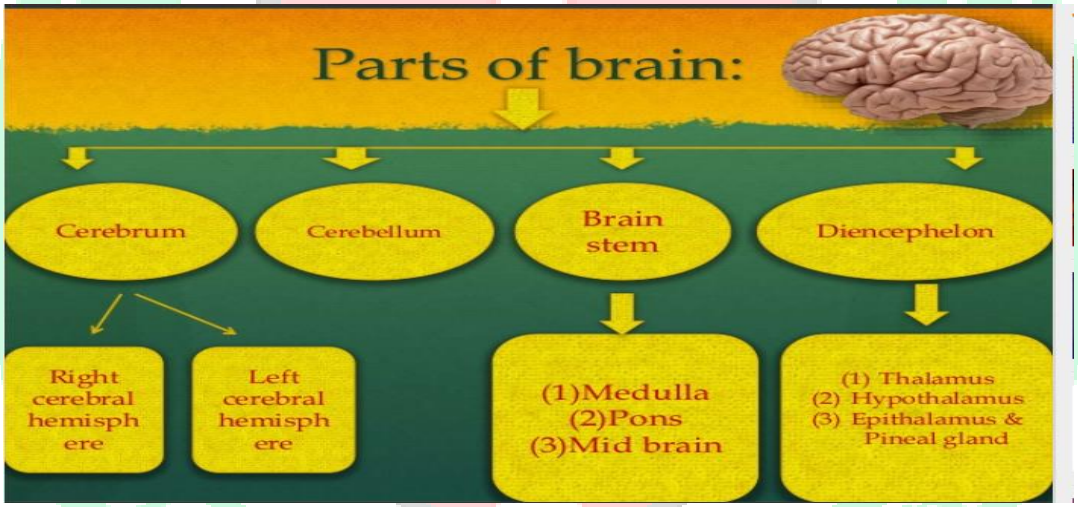
UNIT-1 STRUCTURE AND FUNCTIONS OF BRAIN (CEREBRUM, BRAINSTEM, CEREBELLUM)

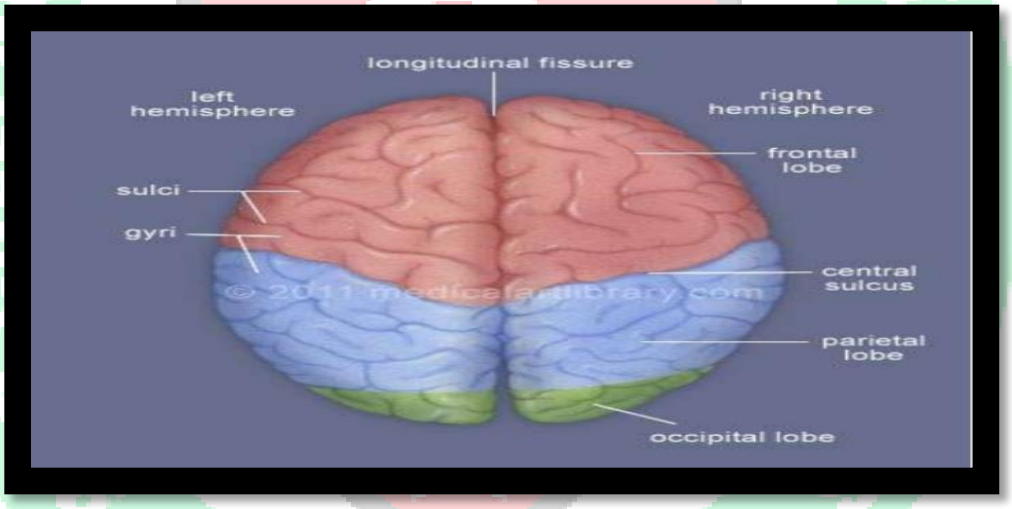
- It is one of the largest organs in the body, and coordinates most body activities.
- It is the center for all thought, memory, judgment, and emotion.
- Each part of the brain is responsible for controlling different body functions, such as temperature regulation and breathing.
- The brain is contained in skull & weighs 1300 - 1400 g
- It is made up of about 1000 billion neurons . each neuron is surrounded by about 10 glial cells (neuroglia).

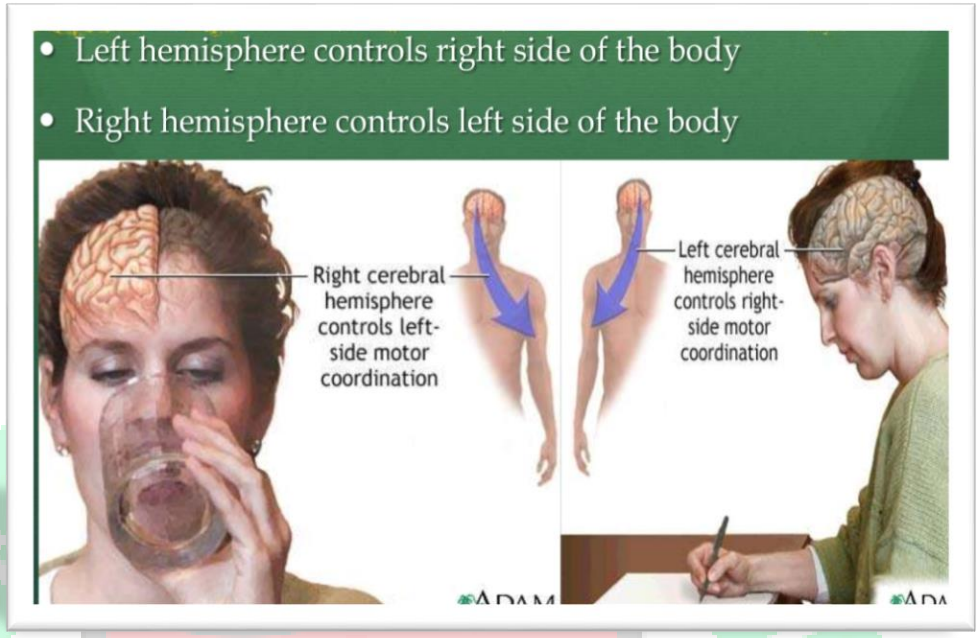


CEREBRUM

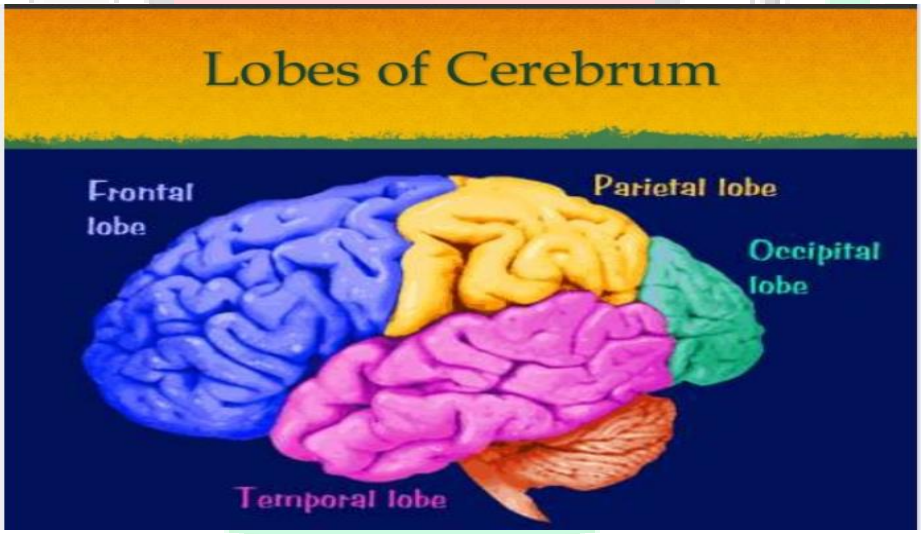
- It is the largest section of the brain
- It is located in the upper portion of the brain and is the area that processes thoughts, judgment, memory, problem solving, and language, imaginations.
- Cerebral cortex – the superficial layer of the cerebrum is “gray mater” & this is 2-4 mm thick called “Cerebral cortex ” contains billions neurons.

- During embryonic development when the brain size increases rapidly, the gray mater of the cortex enlarges much faster than deeper white mater so as result cortical region roles & fold upon itself. these folds are called “gyri” or “convolutions”
- The deepest grooves between the folds are called “fissures”
- The shallower grooves between folds are called “sulci”
- The most prominent fissure, the longitudinal fissure, separates the cerebrum into right & left halves called “cerebral hemispheres”. Each hemisphere has 4 lobes.
- The cerebrum is subdivided into the left and right Both hemisphere are connected by a bridge of nerve fibers that relay information between 2 hemisphere called “corpus callosum”





Lobes of Cerebrum



- **Frontal lobe**: Most anterior portion of the cerebrum (under forehead) "central sulcus" separate frontal & perital lobe.
- controls motor function, personality, and speech • Like Center of reasoning, Planning, some parts of speech, movement, Emotions, problem solving. Also called as "motor cortex"

Parietal lobe:

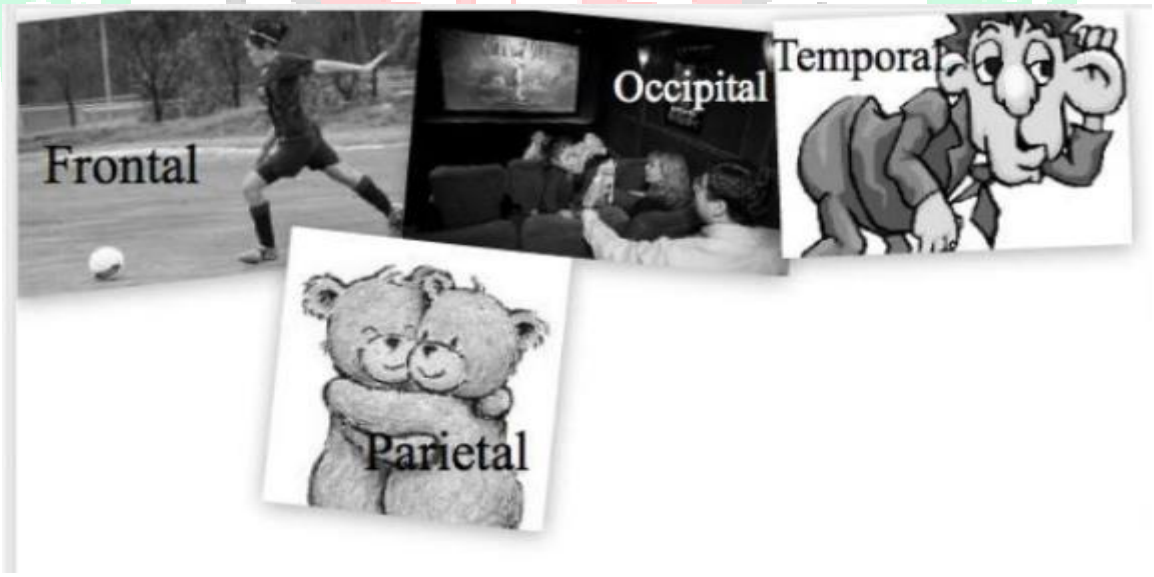
- The most superior portion of the cerebrum(top of head), receives and interprets nerve impulses from sensory receptors and interprets language.
- Receives sensory input from the skin. (touch, pressure, temperature, & pain)
- Also called as "sensory cortex"

Occipital lobe:

- The most posterior portion of the cerebrum (back of the head), Receives input from the eyes & controls vision.
- Also called as "visual cortex"

Temporal lobe:

- The left and right lateral portion of the cerebrum(on the sides of your head above your ears), controls hearing and smell
- Also called "Auditory cortex"



Functions of cerebrum:

- Motor functions like control of voluntary movements.
- sensory functions like perception of pain, temperature, touch, hearing, taste, & smell.
- control of intelligence, speech, memory & learning etc

Cerebellum:

- Second 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 maintaining balance and equilibrium

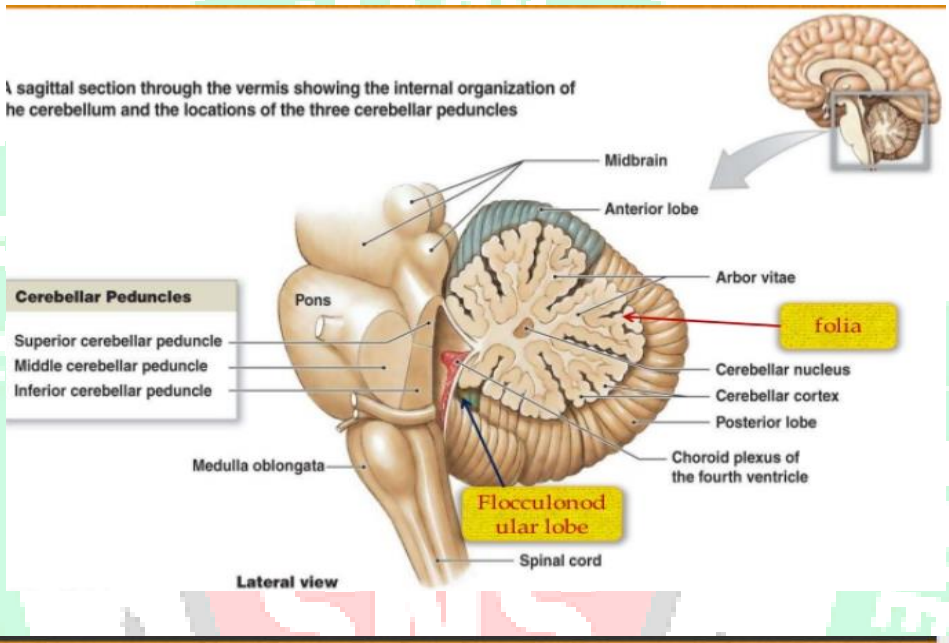
External Structure :

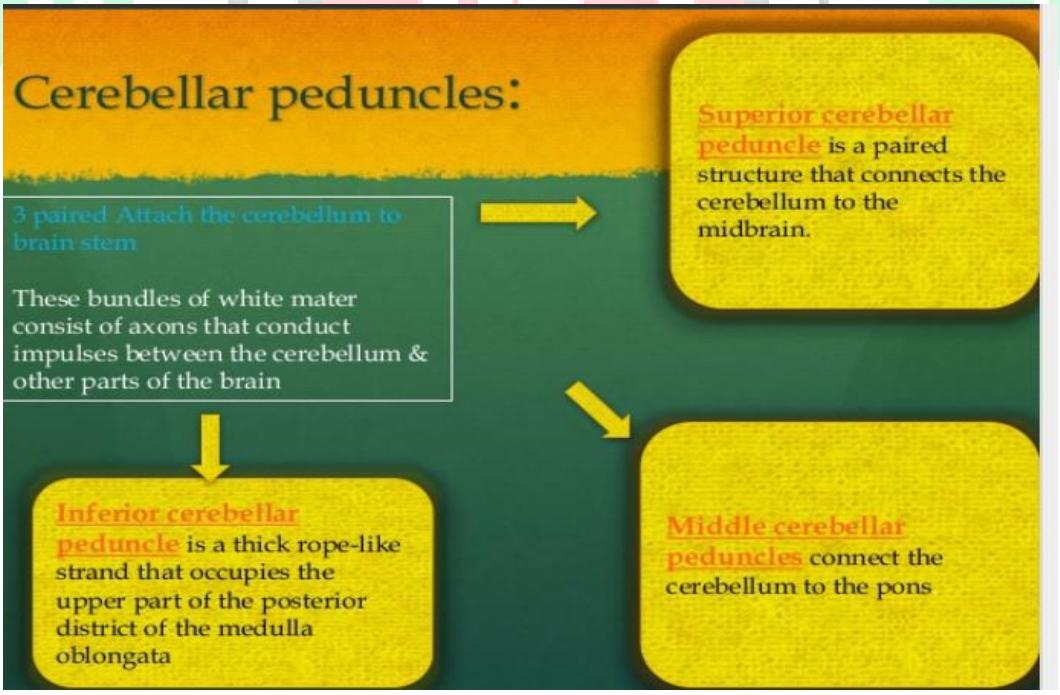
- The external surface , called cerebellar cortex, look like butterfly, constricted area called "vermis"
- The lateral wings or lobes called cerebellar hemisphere that is interconnected by a narrow portion called vermis.
- Each hemisphere consists of lobes separated by deep fissures.
- A part of the human brain that lies in the posterior cranial fossa , inferior to occipital lobes.
- 10% weight of entire brain. 50% of neurons.

Divisions & layers of cerebellum

- Anterior lobe and Posterior lobe both regulate subconscious aspects of skeletal muscle movements
- Flocculonodular lobe – on the inferior surface maintain equilibrium and balance

- Superficial layer of cerebellum called ”cerebellar cortex” consist of gray mater, series of slender & parallel folds called “folia”.
- Deep to gray mater white mater called “arbor vitae” resemble to branch of tree.
- Even deeper white mater are ”cerebellar nuclei”, region of the gray mater having axons carrying impulses from cerebellum to other parts of brain.





Functions of cerebellum:

(1) Coordinate contractions of skeletal muscles

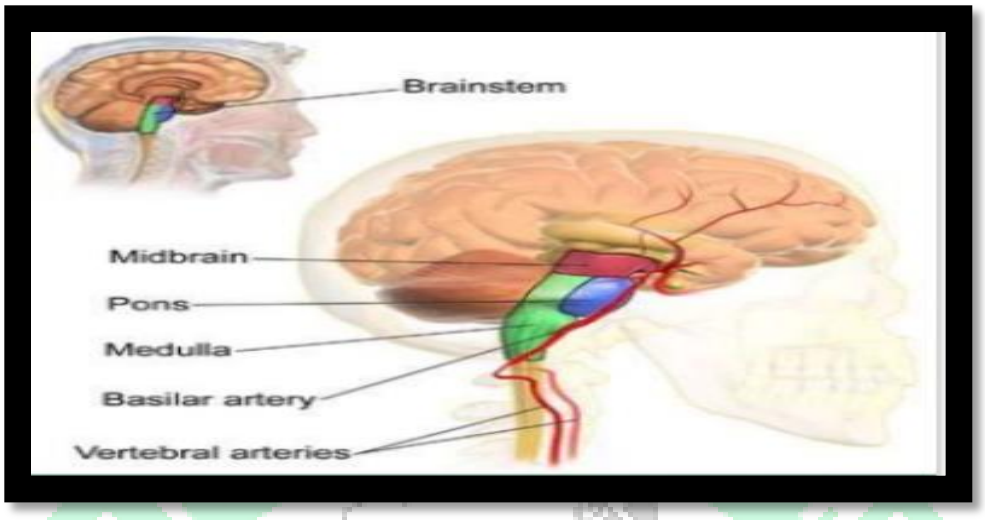
(2) Regulate posture & balance

(3) May play a role in cognition/learning from experiences & language processing

Brain Stem:

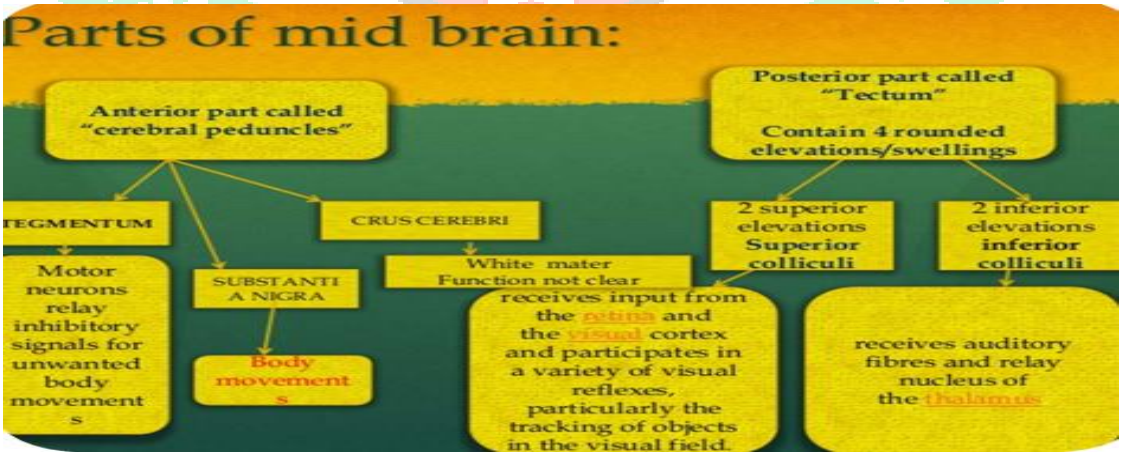
Consists of:

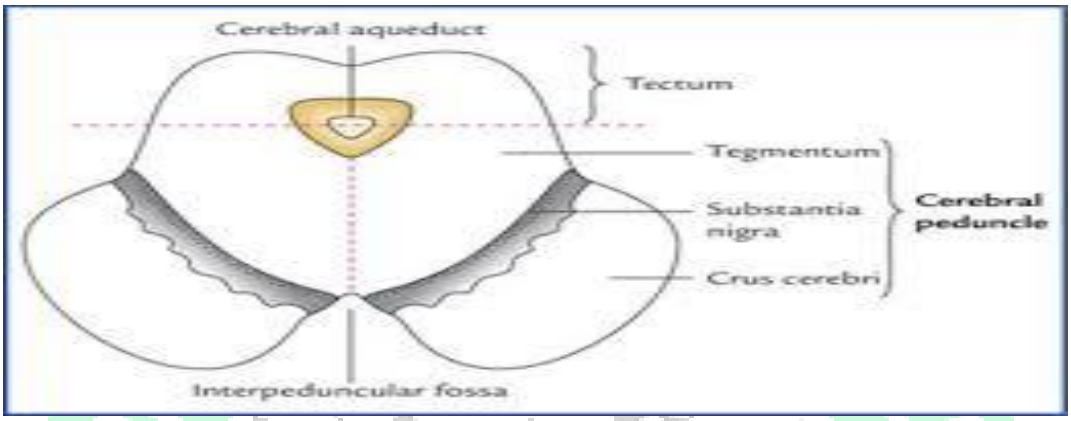
- Midbrain
- Pons
- Medulla oblongata
- Superiorly continuous with Diencephalon
- Inferiorly continuous with spinal cord
- Posteriorly pons and medulla is separated by fourth ventricle.
- Midbrain, pons and medulla connected to cerebellum by superior, middle and inferior cerebellar peduncle resp.



Mid brain :

- The midbrain or mesencephalon extends from the pons to the diencephalon & about 2.5 cm long.
- It acts as a pathway for impulses to be conducted between the brain and the spinal cord.
- associated with vision, hearing, motor control, sleep/wake, arousal (alertness), and temperature regulation.
- Screening of information before it reach high brain structure





Functions of mid brain:

- The midbrain serves important functions in motor movement, particularly movements of the eye, and in auditory and visual processing.
- Dopamine produced in the substantia nigra and ventral tegmental area plays a role in excitation, motivation.
- The midbrain helps to relay information for vision and hearing.

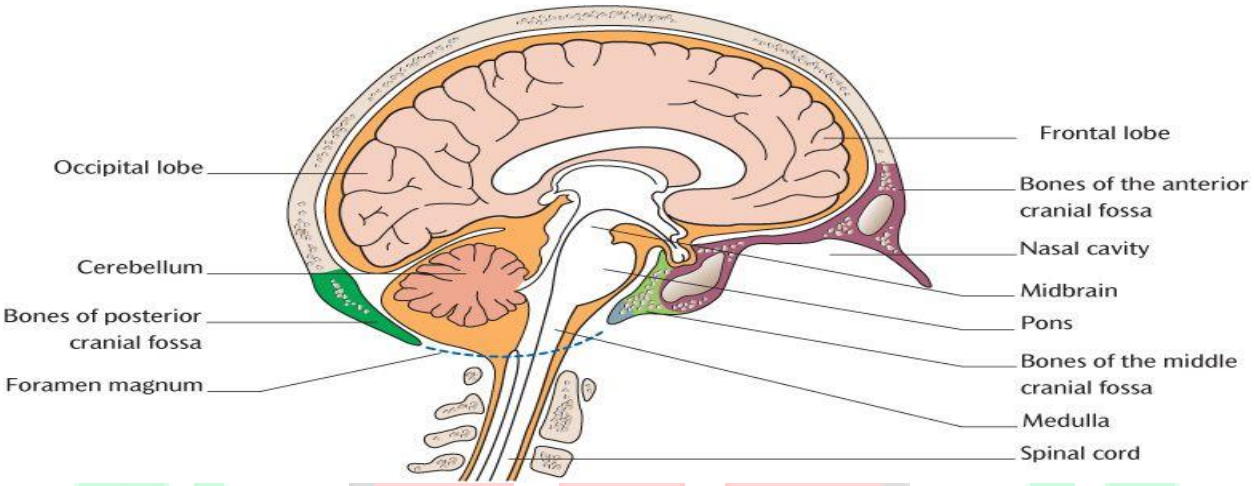
Pons:

- means bridge—connects the cerebellum to the rest of the brain.
- lies between midbrain above and medulla below in front of cerebellum.
- Like medulla it also sensory tract and motor tract.
- Contains nuclei that deals with respiration, swallowing, bladder control, hearing, equilibrium, eye ball movements, facial expressions etc.

Medulla oblongata:

- Lowermost part of the brain stem & continuation of the superior portion of spinal cord.

- Situated at the base of the skull/ starts from foramen magnum & extends to the inferior border of the pons, a distance of about 3 cm.
- The ascending & descending sensory & motor white mater tracts (nerves) connecting brain to spinal cord pass through medulla oblongata.



Its very important because many “regulatory centers ” are located here

(1) The cardiovascular center: regulate the heart rate, force of heartbeat & diameter of blood vessels.

(2) The medullary rhythmicity center: responsible for maintaining basic rhythm of breathing.

(3) The vasomotor center: regulate blood pressure.

(4) others: vomiting, swallowing, cough, hiccupping & sneezing etc.