Basal Nuclei

The basal nuclei are specialized paired masses of gray matter located deep within the white matter of the cerebrum . The basal nuclei include caudate nucleus , putamen, and globus pallidus. The basal nuclei are functionally associated with the subthalamic nuclei (located in the lateral "floor" of the diencephalon) and the substantia nigra of the midbrain. The basal nuclei are particularly important in starting, stopping, and monitoring the intensity of movements executed by the cortex, especially those that are relatively slow or stereotyped, such as arm swinging during walking. **Huntington disease and Parkinson disease**, which are both characterized by uncontrollable movements, are believed to be due to malfunctioning of the basal nuclei

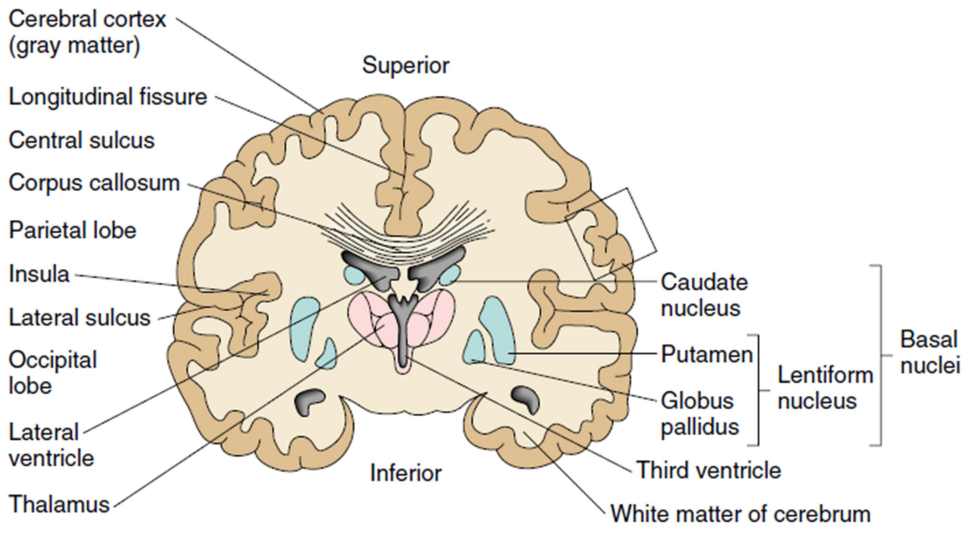

Figure : Coronal sections through the cerebrum and diencephalon.

The cerebellum

The cerebellum, occupies the inferior and posterior aspects of the cranial cavity, posterior to the medulla and pons and inferior to the posterior portion of the cerebrum. Like the cerebrum, the cerebellum has a highly folded surface that greatly increases the surface area of its outer gray matter cortex. The cerebellum accounts for about a tenth of the brain mass. A deep groove known as the transverse fissure, along with the tentorium cerebelli, which supports the posterior part of the cerebrum, separate the cerebellum from the cerebrum. The cerebellum consists of

central constricted area called the vermis (worm), and two lateral "wings" or lobes are the cerebellar hemispheres.

The superficial layer of the cerebellum, called the cerebellar cortex, consists of gray matter in a series of slender, parallel folds called folia (leaves). Deep to the gray matter are tracts of white matter called arbor vitae (tree of life) that resemble branches of a tree. Even deeper, within the white matter, are the cerebellar nuclei, regions of gray matter that give rise to axons carrying impulses from the cerebellum to other brain centers. Three paired cerebellar peduncles attach the cerebellum to the brain stem.

Functions of cerebellum

- Balance.
- Movement.
- Co-ordination.
- Spatial awareness.

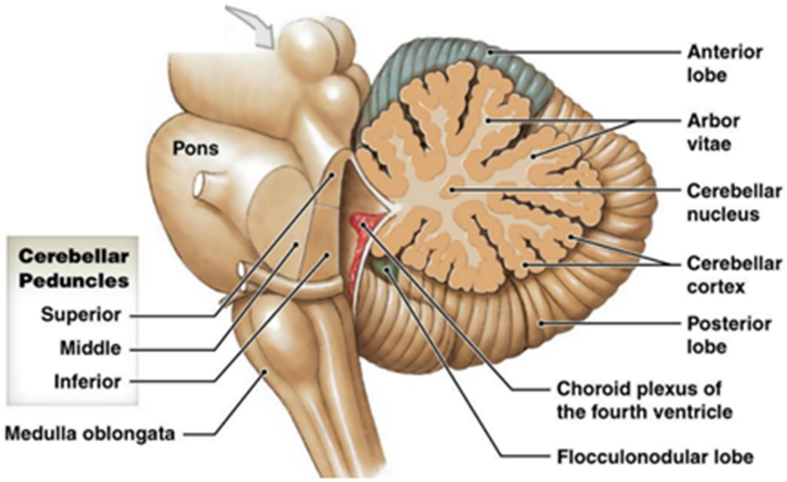

Figure: the cerebellum.

The Diencephalon

The diencephalon consists of

- the thalamus,
- hypothalamus.

The hypothalamus, it forms the floor of the third ventricle, it caps the brain stem . The mammillary bodies, paired pea like nuclei that bulge anteriorly from the hypothalamus, are relay stations in the olfactory pathways. The infundibulum a stalk of hypothalamic tissue that connects the pituitary gland to the base of the hypothalamus. The main function of the hypothalamus are:

1. it contain the autonomic nervous system control center.
2. it is a part of the limbic system (the emotional part of the brain).
3. regulation of food body temperature.
4. regulation of food intake.
5. regulation of water balance and thirst.
6. regulation of sleep-wake cycles (our biological clock).
7. it control the secretion of hormones by the pituitary gland.

The thalamus, consists of two masses of gray matter located in the sides and roof of the third ventricle. The thalamus act as arelay center for all sensory input except for smell. The thalamus is involved in arousal of the cerebrum, and it also participates in higher mental functions such as memory and emotions.

Brainstem,

Brainstem is area at the base of the brain that lies between the deep the cerebral hemispheres and the cervical spinal cord and that serves a critical role in regulating certain involuntary actions of the body, including heartbeat and breathing. The brainstem is divided into three sections in humans:

1. the midbrain
2. the pons
3. the medulla oblongata

function, the brain stem control following activities

•Heart rate
• Breathing
• Blood pressure
• Reflexes e.g. swallowing
• Level of consciousness
• Hormone regulation

The Reticular Formation

The Reticular Formation, is a complex network of nuclei (masses of gray matter) and fibers that extend the length of the brain stem. The reticular formation receives sensory signals, which it sends up to higher centers, and motor signals, which it sends to the spinal cord.

The reticular formation performs very important functions. These include:

- Controlling the contractions of skeletal muscles .

- Control of facial expressions associated with emotions
- Control of skeletal muscle tone and balance
- Controlling the respiratory muscles
- Controlling the level of consciousness and wakefulness
- Endocrine control

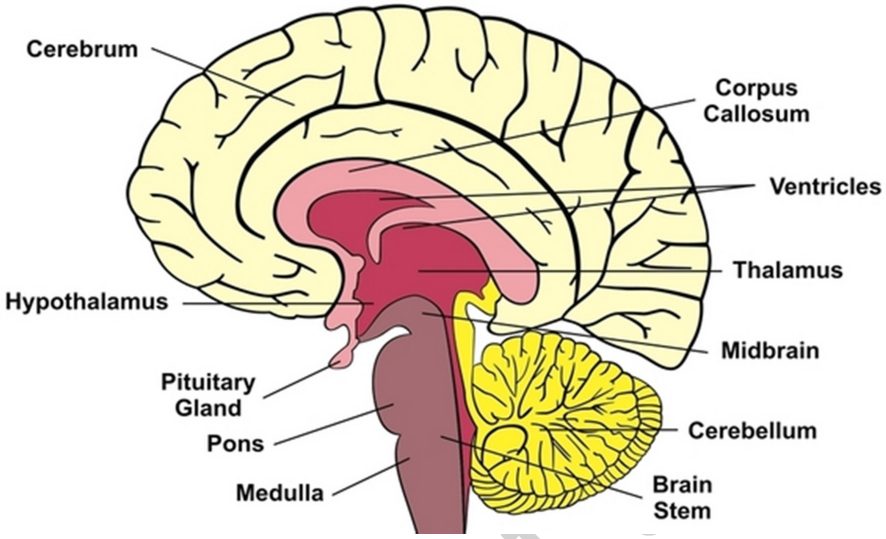

Figure. Sagittal section sections through the brain.

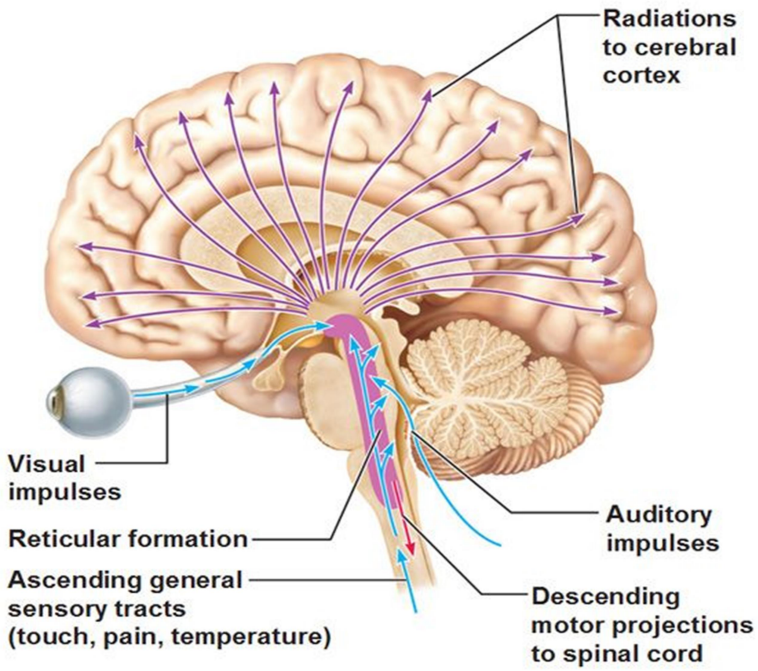

Figure : reticular formation.