

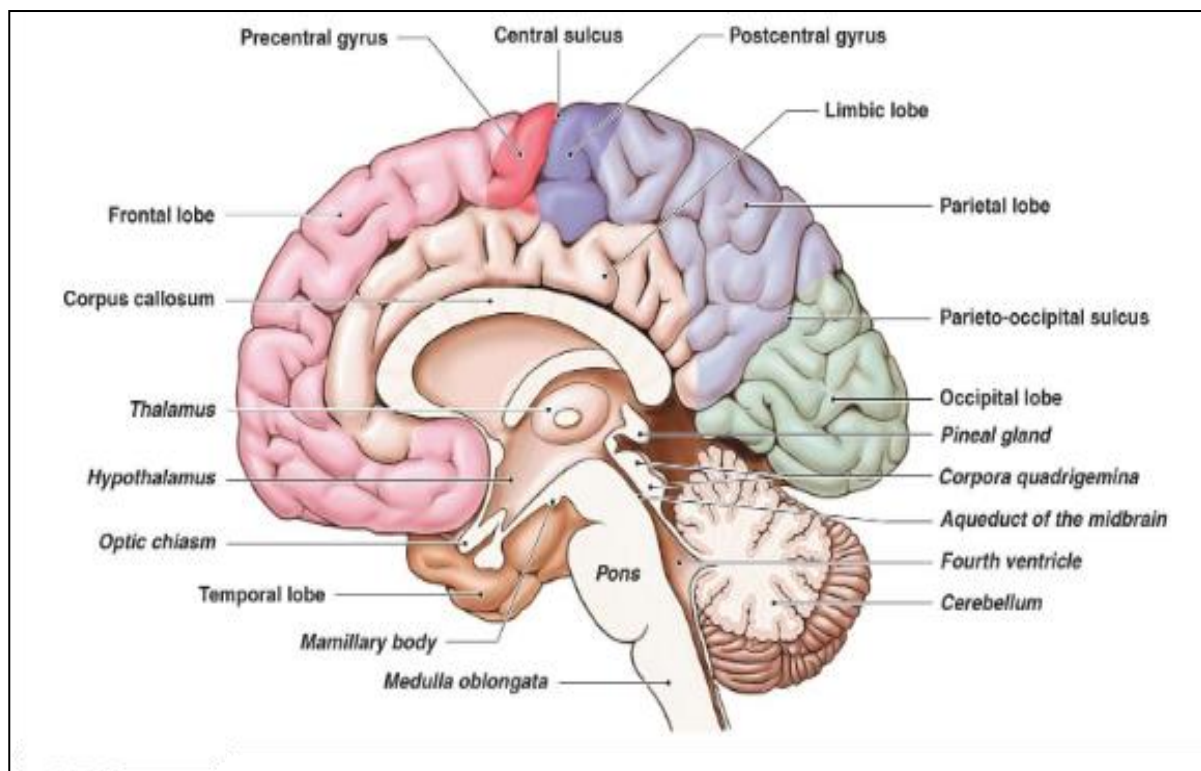
Structure and function of brain

The human brain controls nearly every aspect of the human body ranging from physiological functions to cognitive abilities. It functions by receiving and sending signals via neurons to different parts of the body. The human brain, just like most other mammals, has the same basic structure, but it is better developed than any other mammalian brain.

The Human Brain

On average, an adult brain weighs between 1.0 kg – 1.5 kg. It is mainly composed of neurons – the fundamental unit of the brain and nervous system. Recent estimates have suggested that the brain contains anywhere between 86 billion to 100 billion neurons.

The **brain**, along with the **spinal cord**, constitutes the central nervous system. It is responsible for thoughts, interpretation and origin of control for body



movement

Fig: The Human Brain

Location of brain

The brain is enclosed within the skull, which provides frontal, lateral and dorsal protection. The skull consists of 22 bones, 14 of which form the facial bones and the remaining 8 form the cranial bones. Anatomically, the brain is contained within the cranium and is surrounded by the cerebrospinal fluid.

The Cerebrospinal Fluid (CSF) is a fluid that circulates within the skull and spinal cord, filling up hollow spaces on the surface of the brain. Every day, the specialized ependymal cells produce around 500mL of cerebrospinal fluid.

The primary function of the CSF is to act as a buffer for the brain, cushioning mechanical shocks and dampening minor jolts. It also provides basic immunological protection to the brain.

Furthermore, CSF provides buoyancy for the brain. i.e., the brain is suspended in a layer of CSF, wherein, the weight of the brain is nearly negated. If the brain is not suspended in CSF, it would be impeded by its weight, consequently cutting off the blood supply in the lower half of the brain. It would lead to the death of neurons in the affected area.

Parts of Human brain

1. Cerebrum or forebrain
2. Midbrain The brainstem
3. Pons varolli
4. Medulla oblongata
5. Cerebellum
6. hindbrain

Cerebrum:

The Parts of the Central Nervous System It is the largest part of the brain and occupies anterior and middle part of the cranial cavity. It is divided by a deep cleft into right and left cerebral hemispheres. Deep within the brain, the hemispheres are connected by a mass of nerve fibers called corpus callosum. The superficial part of the cerebrum is composed of nerve cell body, forming cerebral cortex. The cerebral cortex shows many enfolding of varying depth. The exposed areas of the fold are called as gyro or convolutions and are separated by sulci or fissure. The convolutions help in increasing surface area of the cerebrum. Each hemisphere of the cerebrum is divided into the following lobes: .

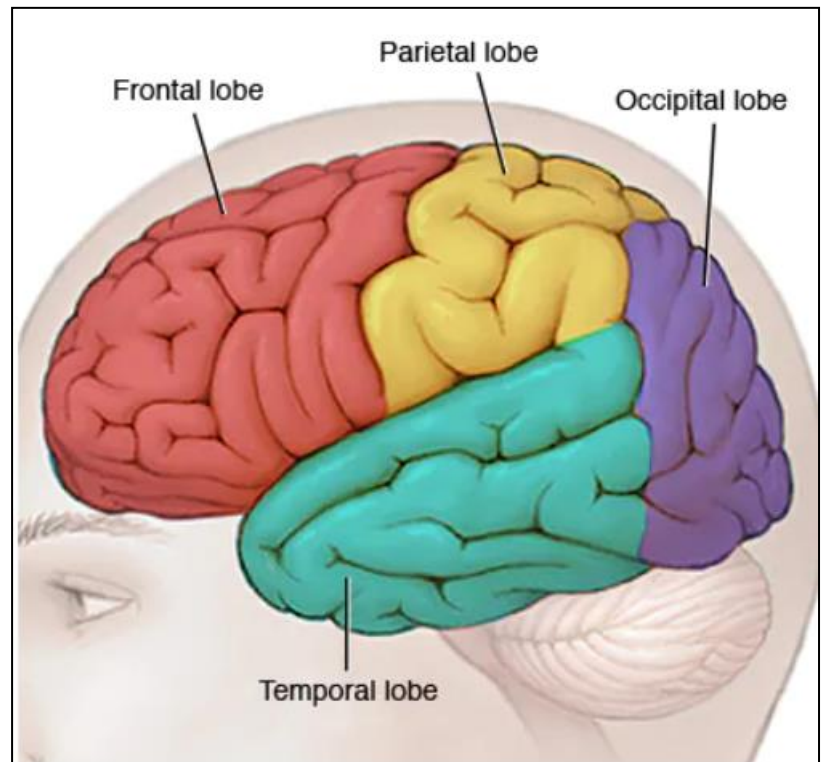
1. **Frontal lobe:** It is associated with parts of speech, planning, reasoning, problem-solving and movements.
2. **Parietal lobe:** Help in movements, the perception of stimuli and orientation.

3. **Occipital lobe:** It is related to visual processing.
4. **Temporal lobe:** This region is related to perception and recognition of memory, auditory stimuli and speech.

Other points: It is the largest portion of the brain, encompasses about two-thirds of the brain mass. It consists of two hemispheres divided by a fissure – corpus callosum

It includes the cerebral cortex, the medullary body, and basal ganglia

the cerebral cortex is the layer of the brain often referred to as grey matter because it has cell bodies and synapses but no myelin.



The cortex (thin layer of tissue) is grey because nerves in this area lack the insulation or white fatty myelin sheath that makes most other parts of the brain appear to be white.

The cortex covers the outer portion (1.5mm to 5mm) of the cerebrum and cerebellum.

The cortex consists of folded bulges called gyri that create deep furrows or fissures called sulci. The folds in the brain add to its surface area which increases the amount of grey matter and the quantity of information that can be processed.

Medullary body – is the white matter of the cerebrum and consists of myelinated axons.

Commissural fibres – conduct impulses between the hemispheres and form corpus callosum.

Projection fibres – conduct impulse in and out of the cerebral hemispheres
 Association fibres – conduct impulses within the hemispheres.

Basal ganglia – masses of grey matter in each hemisphere that are involved in the control of voluntary muscle movement.

Functions of the Cerebrum Nervous System

Mental activities involved in memory, intelligence, sense of responsibility; thinking, reasoning, moral sense, and learning. .

Sensory perception, including the perception of pain, temperature, touch; sight, hearing, taste and smell.

Initiation and control of voluntary muscle contraction.

The brain consists of two types of tissues: grey matter and White matter.

1. **Grey matter** mainly consists of various types of cells, which make up the bulk of the brain.
2. **White matter** is primarily composed of axons, which connect various grey matter areas of the brain with each other.

The exterior portion of the cerebrum is called the cortex or the cerebral mantle.

The cortex is extremely convoluted, due to which, it has a large surface area.

The cerebrum also includes:

1. **Sensory areas:** To receive the messages.
2. **Association areas:** These areas integrate the incoming sensory information. It also forms a connection between sensory and motor areas.
3. **Motor areas:** This area is responsible for the action of the voluntary muscles.

Other Areas

Deep within the cerebral hemispheres, there are groups of cell bodies termed as nuclei. They act as relay stations where impulses are passed from one neuron to the next in a chain.

Following are important masses of grey matter.

1. Basal nuclei.
2. Thalamus
3. Hypothalamus.

1. Basal nuclei:

This area lies deep within the cerebral hemispheres. It is supposed to influence skeletal muscle tone. If control is inadequate or absent, movements are jerky, clumsy and uncoordinated.

2. Thalamus:

It consists of two masses of nerve cells and fibres situated within the cerebral hemispheres just below the corpus callosum, one on each side of the third ventricle. Sensory input from the skin, viscera and special sense organs is transmitted to the thalamus before redistribution to the cerebrum.

4. Hypothalamus:

It is composed of a number of groups of nerve cells. It is situated below and in front of the thalamus, immediately above the pituitary gland. It is linked to the posterior lobe of the pituitary gland by nerve fibres and to the anterior lobe by a complex system of blood vesicles. It controls the output of hormones from both lobes of gland. It controls the following additional functions.

- Receives impulses
- Regulates body temperature
- Controls the mood and emotions
- Controls the sense of taste and smell
- Synthesizes the body's essential hormones
- Coordinates the messages from the autonomous nervous system
- Controls appetite, peristalsis, the rate of heartbeat, and blood pressure
- Forms an axis with the pituitary gland which is the main link between the nervous and the endocrine systems.