

## The brain

The brain is a fascinating and complex organ. It is responsible for senses, movement and control, emotions and feelings, language and communication, thinking and memory. About 100 billion neurons and trillions neuroglia , its mass about 1300 g in adults. The brain is commonly discussed in terms of its four major regions

- cerebral hemispheres.
- Diencephalon.
- brain stem.
- cerebellum.

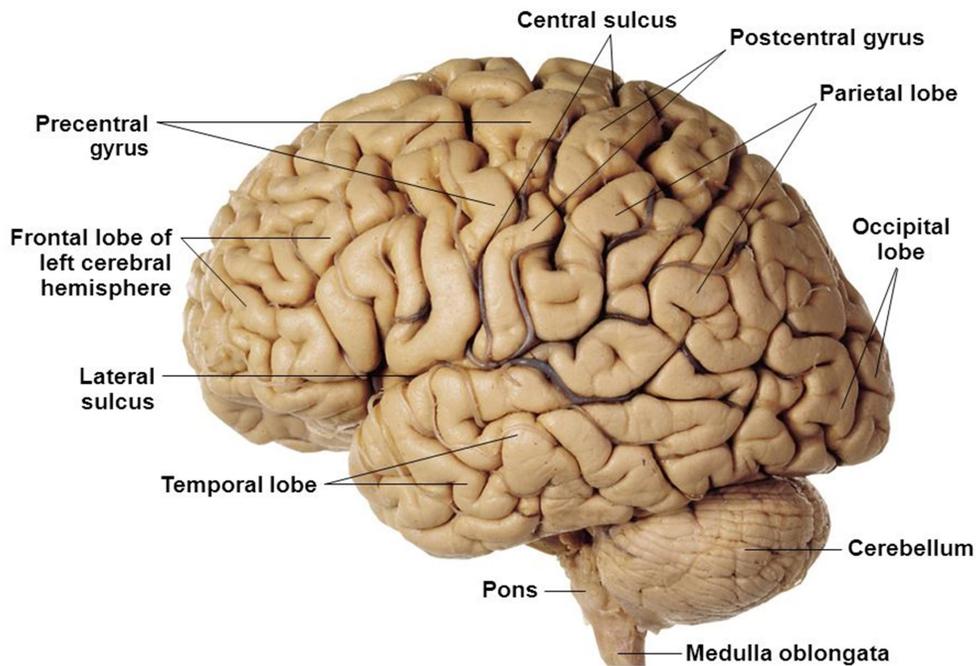


Figure: anatomy of the brain.

## The cerebral hemispheres

This is the largest part of the brain it account for about 83% of total brain mass and it occupies the anterior and middle cranial fossae. It is 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 falx cerebri is formed by the dura mater. It separates the two hemispheres and penetrates to the depth of 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). Each hemisphere is chiefly concerned with the sensory and motor functions of the opposite (contralateral) side of the body. Although largely symmetrical in structure, the two hemispheres are not entirely equal in function. Instead, there is a lateralization (specialization) of cortical functions.

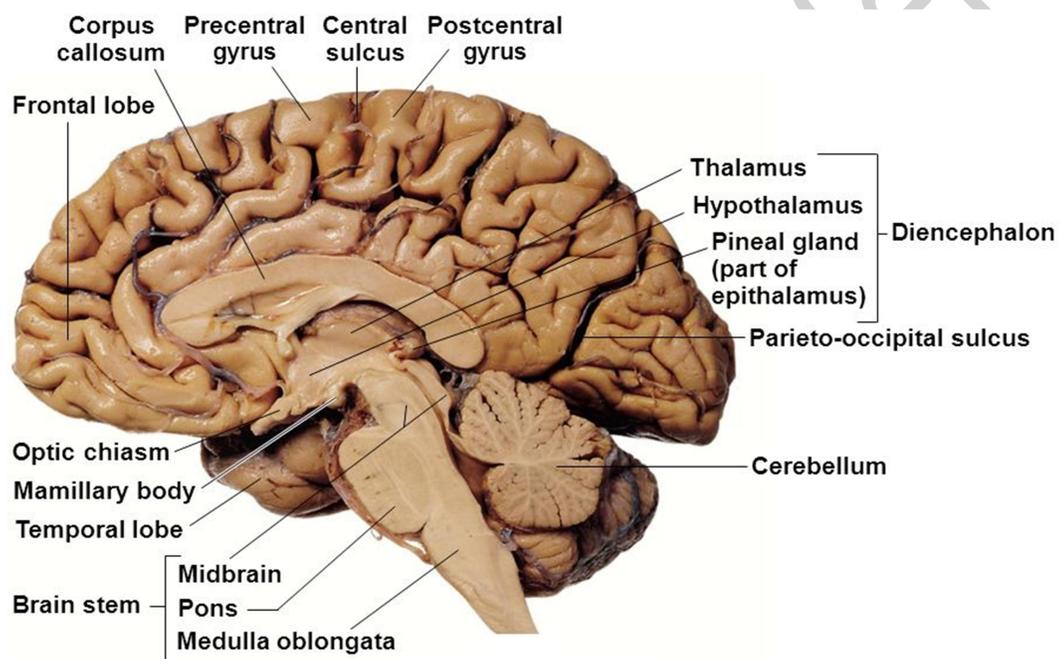


Figure: sagittal section of the brain.

### Cerebral lobes

Each cerebral hemisphere can be further subdivided into four lobes:

**1. frontal lobe**, this lobe is responsible for:

- Executive function – decisions, planning ahead, attention, behaviour, emotion
- Speech and language
- Memory
- Planned movement

### 2. Parietal lobes

These are the processing centers of the brain and responsible for:

- Perception, making sense of things
- Sensation – touch, pain, hot or cold.

### 3.Occipital lobes

Occipital lobes process visual information and control the ability to recognise shape, colour, objects and faces.

### 4.Temporal lobes

These are responsible for processing sound and understanding speech. They also form part of the system that controls memory. The left lobe processes receptive language and the right lobe processes musical awareness.

### The main area of cerebral cortex

#### Motor area

**1.Primary (somatic) motor cortex**, the primary motor cortex is located in the precentral gyrus of the frontal lobe of each hemisphere . This area consciously control the precise or skilled voluntary movements of skeletal muscles. There are two neurons involved in the pathway to skeletal muscle.

- the **upper motor neurone**, descends from the motor cortex to the spinal cord.
- At the spinal cord it synapses with a second neurone (**the lower motor neurone**), which leaves the spinal cord and travels to the target muscle. It terminates at the motor end plate of a muscle fibre.

Note: Damage to either of these neurons may result in muscle paralysis.

**2.Premotor cortex**, lie just anterior to the precentral gyrus in the frontal lobe. This region controls learned motor skills of a repetitious or patterned nature, such as playing a musical instrument and typing.

**3. Broca's area**, lies anterior to the inferior region of the premotor area , it directs the muscles involved in speech production.

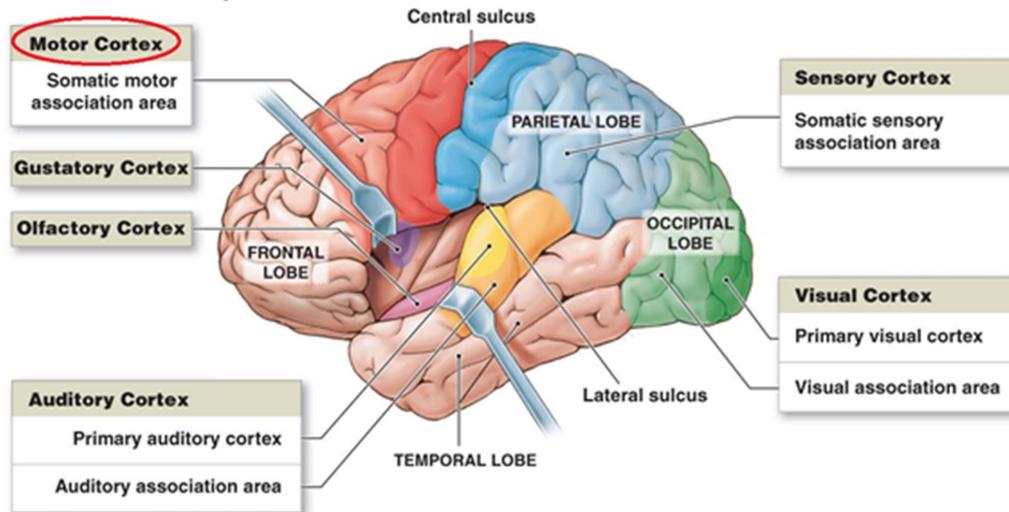


Figure: The main area of cerebral cortex

**4. somatosensory area**, this is the area immediately behind the central sulcus. Here sensations of pain, temperature, pressure and touch, awareness of muscular movement and the position of joints (proprioception) are perceived. The somatosensory area of the right hemisphere receives impulses from the left side of the body and vice versa. The size of the cortical areas representing different parts of the body is proportional to the extent of sensory innervation, e.g. the large area for the face is consistent with the extensive sensory nerve supply by the three branches of the trigeminal nerves (5th cranial nerves).

**5. Visual areas.** The primary visual (striate) cortex located on the occipital lobe, concerned with visual sensation.

**6. Auditory areas.** Each primary auditory cortex is located in the superior margin of the temporal lobe, concerned with hearing sensation.

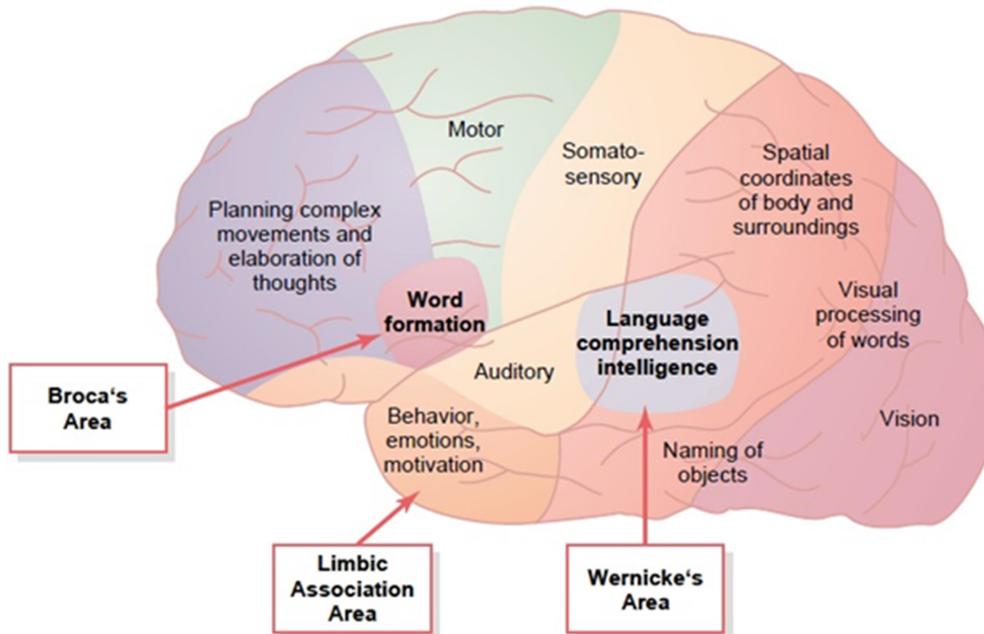


Figure: The main area of cerebral cortex

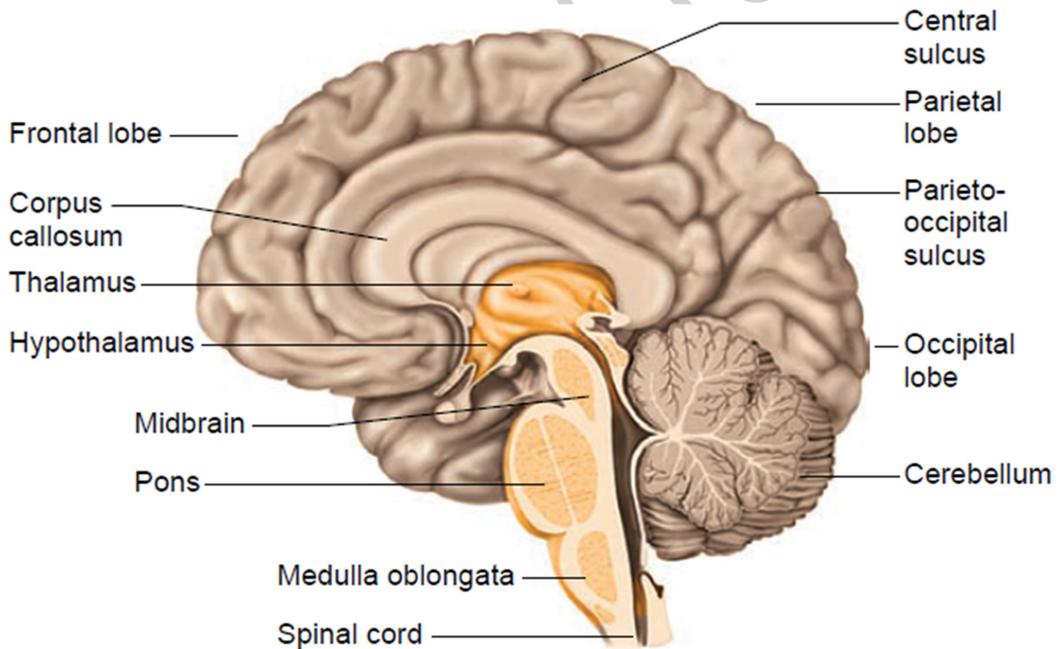


Figure: sagittal section of the brain.