

# **CEREBRUM**

**DR. JAMILA EL MEDANY**

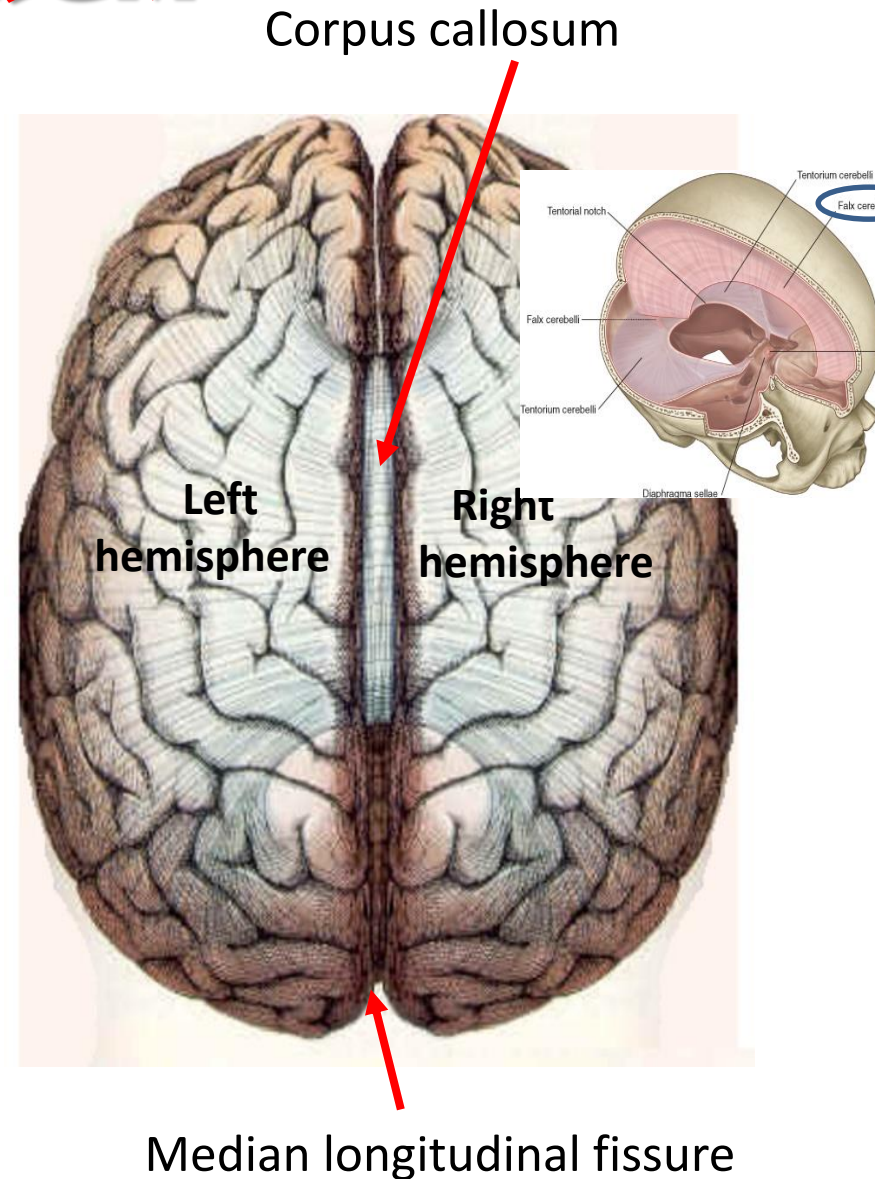
# Objectives

*At the end of the lecture, the student should be able to:*

- *List the parts of the cerebral hemisphere (cortex, medulla, basal nuclei, lateral ventricle).*
- *Describe the subdivision of a cerebral hemisphere into lobes.*
- *List the important sulci and gyri of each lobe.*
- *Describe different types of fibers in cerebral medulla (association, projection and commissural) and give example of each type.*

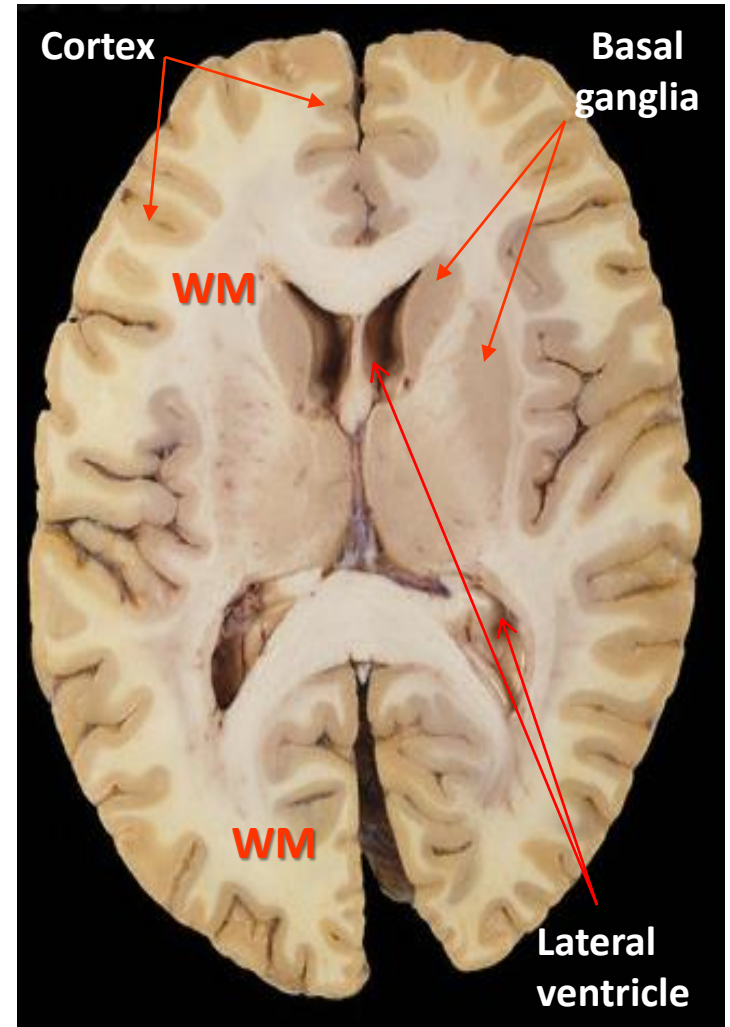
# CEREBRUM

- *Largest part of the forebrain.*
- *Divided into two halves, the (**cerebral hemispheres**), which are separated by a deep median longitudinal fissure which lodges the **falx cerebri**.*
- *In the depth of the fissure, the hemispheres are connected by a bundle of fibers called the **corpus callosum**.*



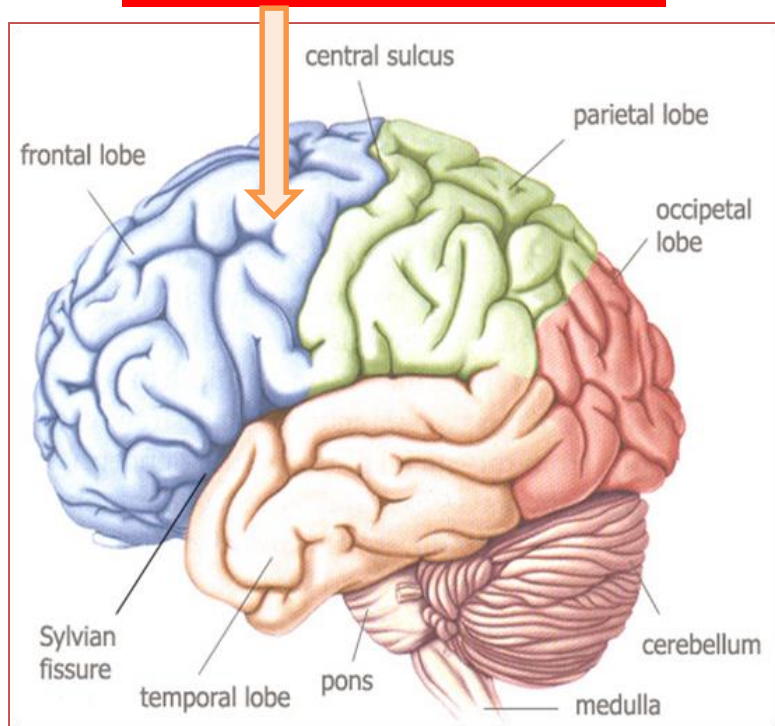
# STRUCTURE OF CEREBRUM

- ❑ **Cerebral cortex:** Superficial layer of grey matter
- ❑ **Medulla (White matter) :** Deeper to the cortex, contains axons to and from the cells of the cortex
- ❑ **Basal ganglia:** Number of nuclear masses buried within the white matter
- ❑ **Lateral ventricle:** The cavity of hemisphere

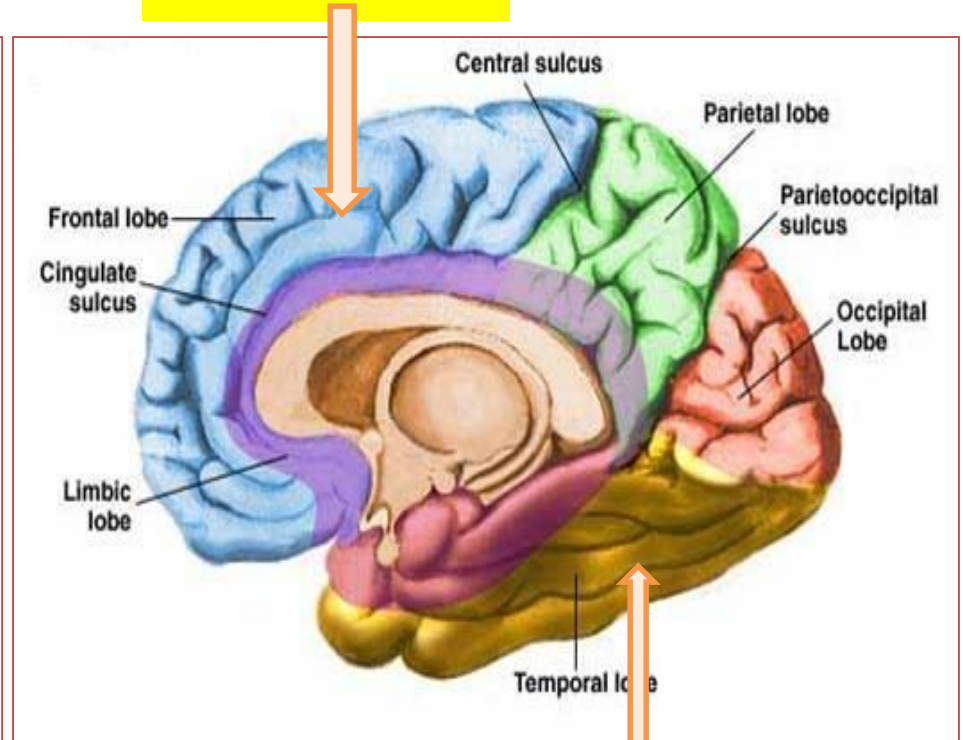


# Surfaces(3)

## Superolateral



## Medial



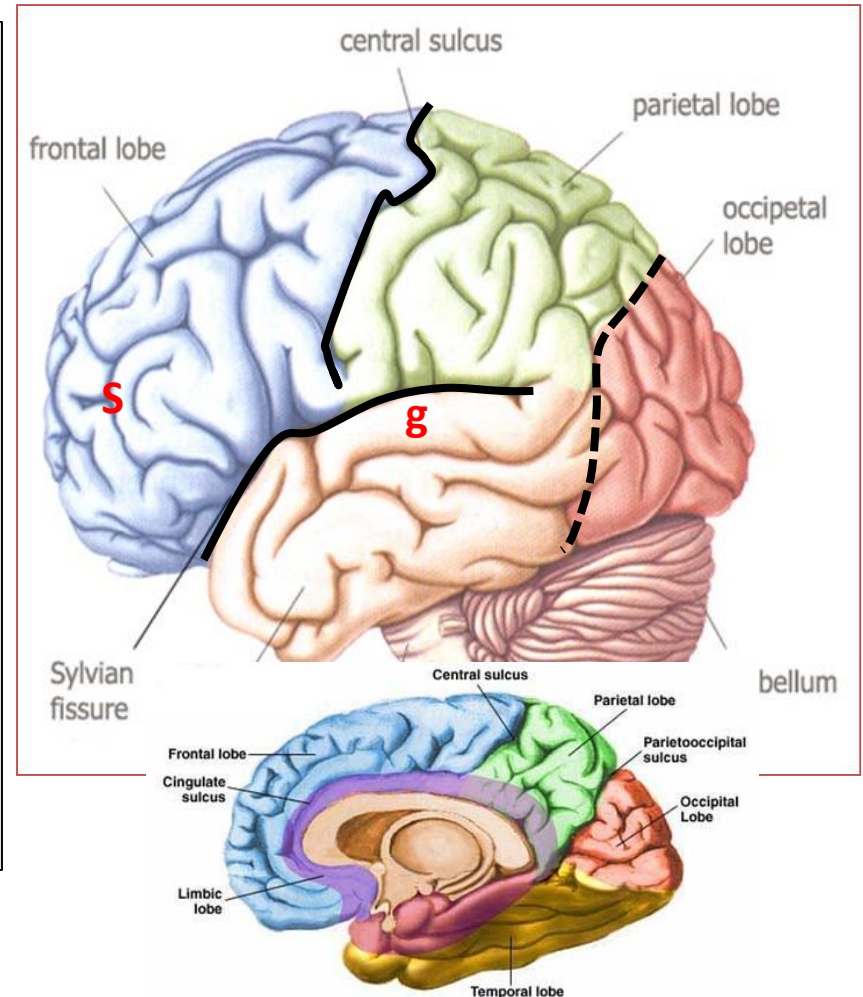
## Inferior (tentorial)



# LOBES OF CEREBRUM

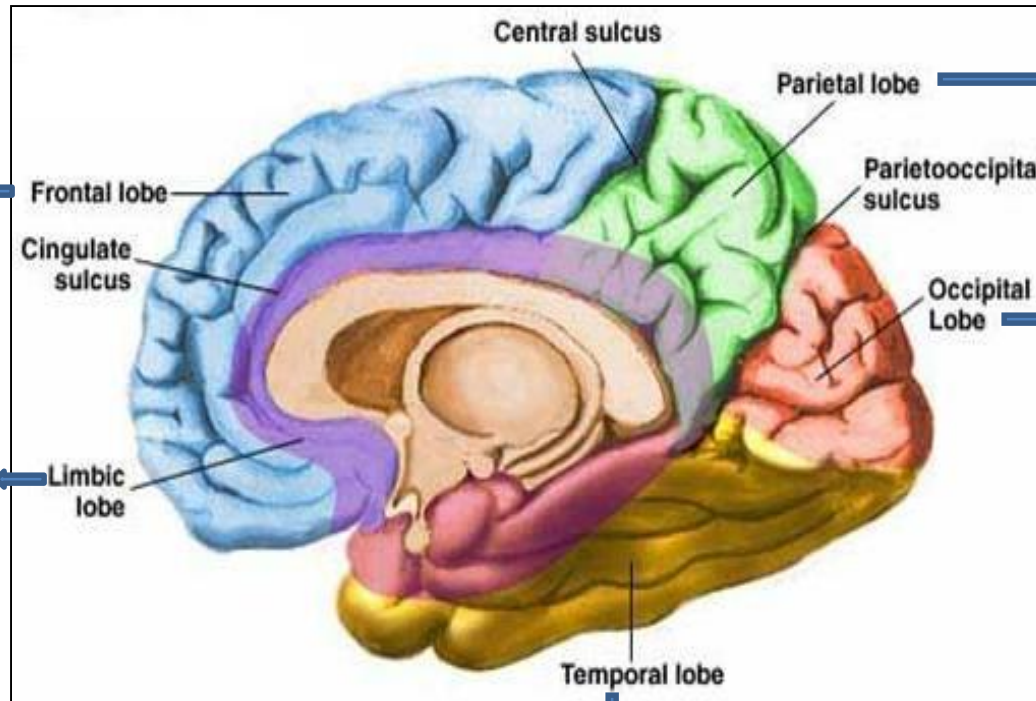
The superficial layer of grey matter is highly convoluted to form a complex pattern of ridges (**gyri**) and grooves (**sulci**). This arrangement maximizes the surface area of the cerebral cortex (about 70% is hidden within the depths of sulci).

- **Three sulci**, consistent in position, named **central**, **lateral (sylvian)** & **parieto-occipital**, divide each hemisphere into **FOUR** lobes: **Frontal**, **Parietal**, **Temporal** & **Occipital** (named after overlying bones) Functionally each hemisphere contains a '**limbic lobe**' on the medial surface.



# FUNCTION OF LOBES

**motor function,  
motivation,  
aggression,  
smell and  
mood**



**reception  
and  
evaluation  
of sensory  
information**

**visual processing**

**emotions,  
memory  
storage &  
Linking  
conscious  
intellectual  
functions with  
the unconscious  
autonomic  
functions,**

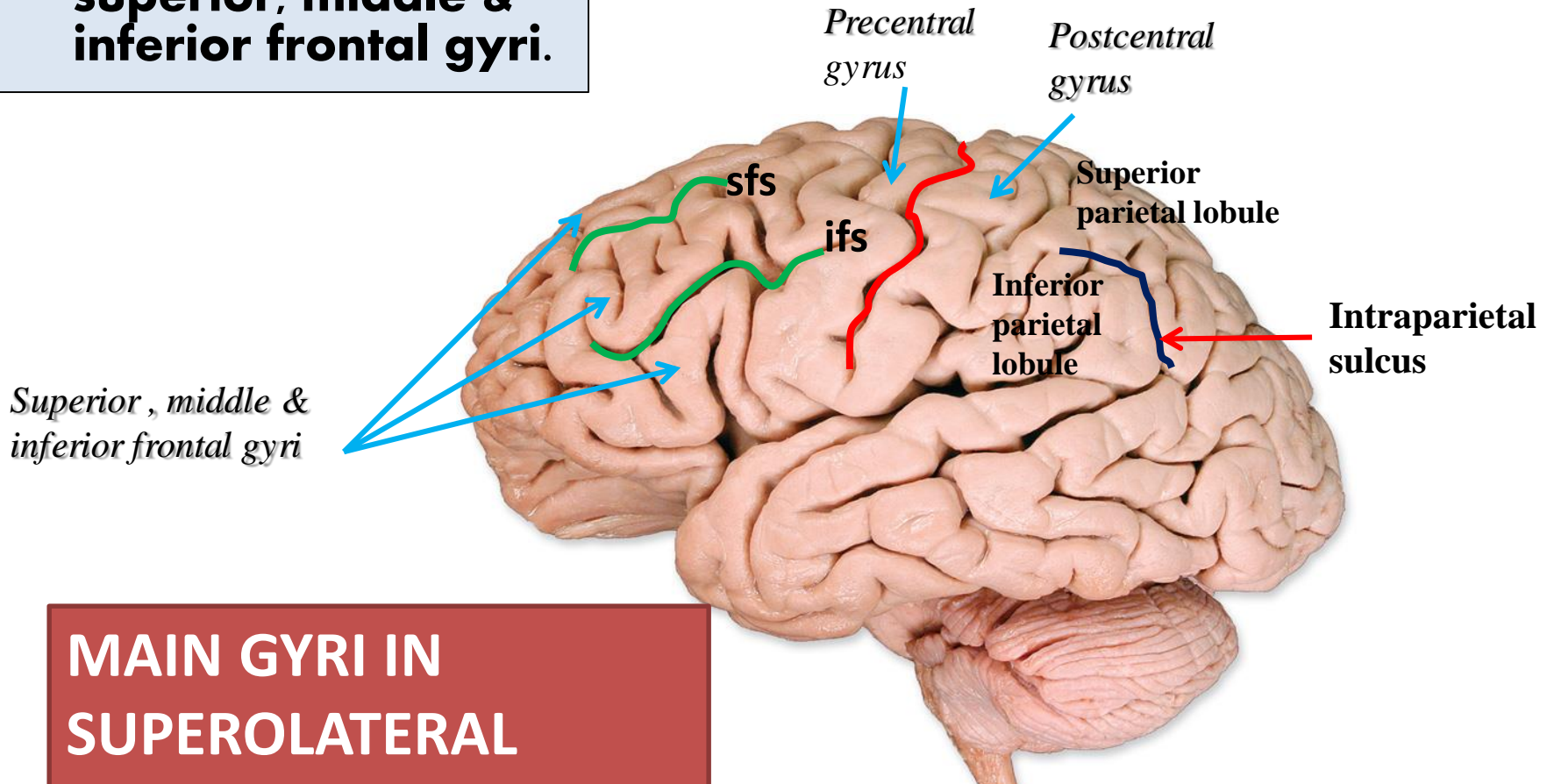
**smell, hearing,  
memory and  
abstract  
thought**

☐ **Frontal lobe:**

- **Precentral gyrus.**
- **Superior & inferior frontal sulci divide the lobe into superior, middle & inferior frontal gyri.**

☐ **Parietal lobe:**

- **Postcentral gyrus.**
- **Intraparietal sulcus divide the lobe into superior & inferior parietal lobules.**

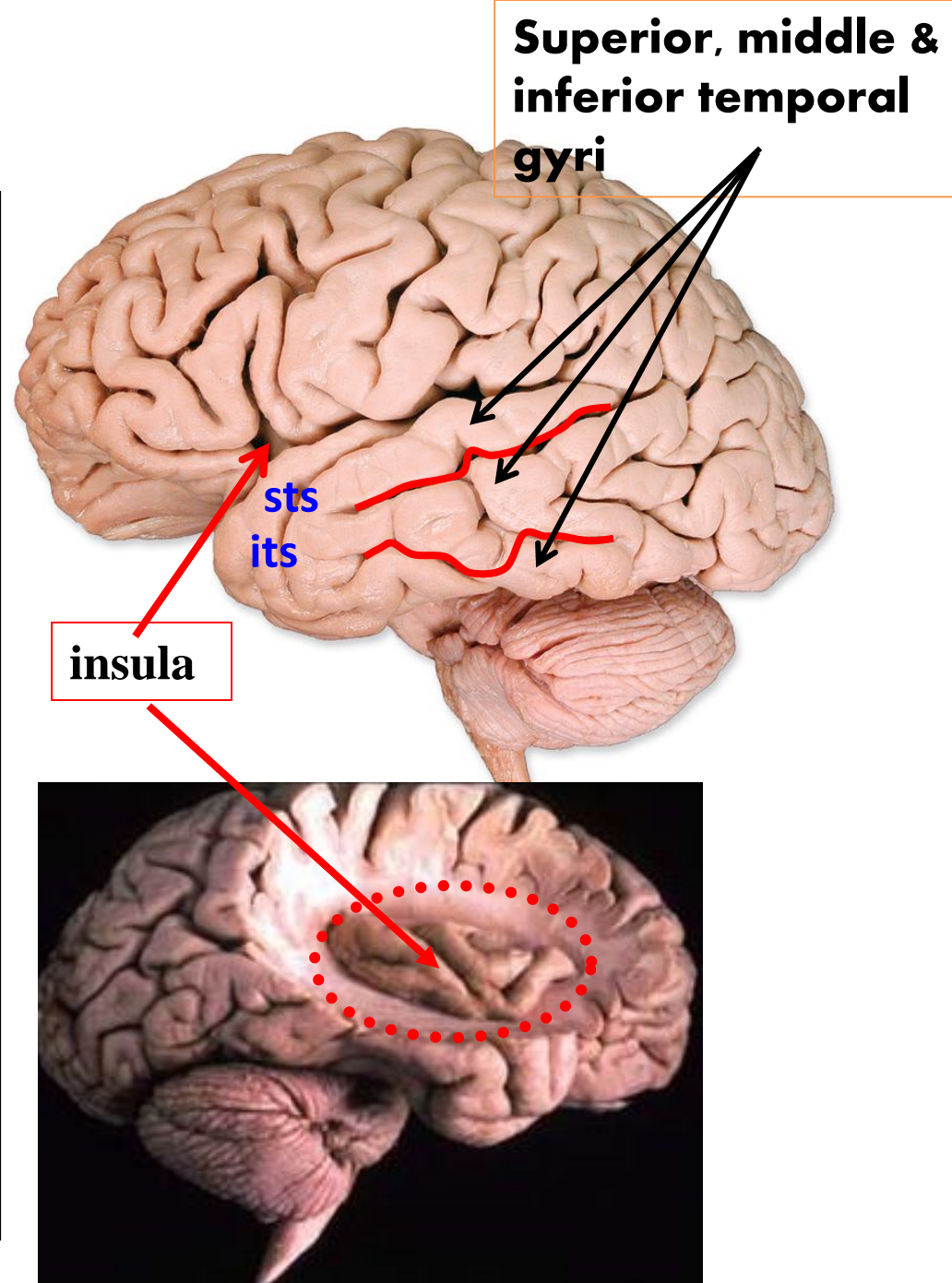


**MAIN GYRI IN  
SUPEROLATERAL  
SURFACE**



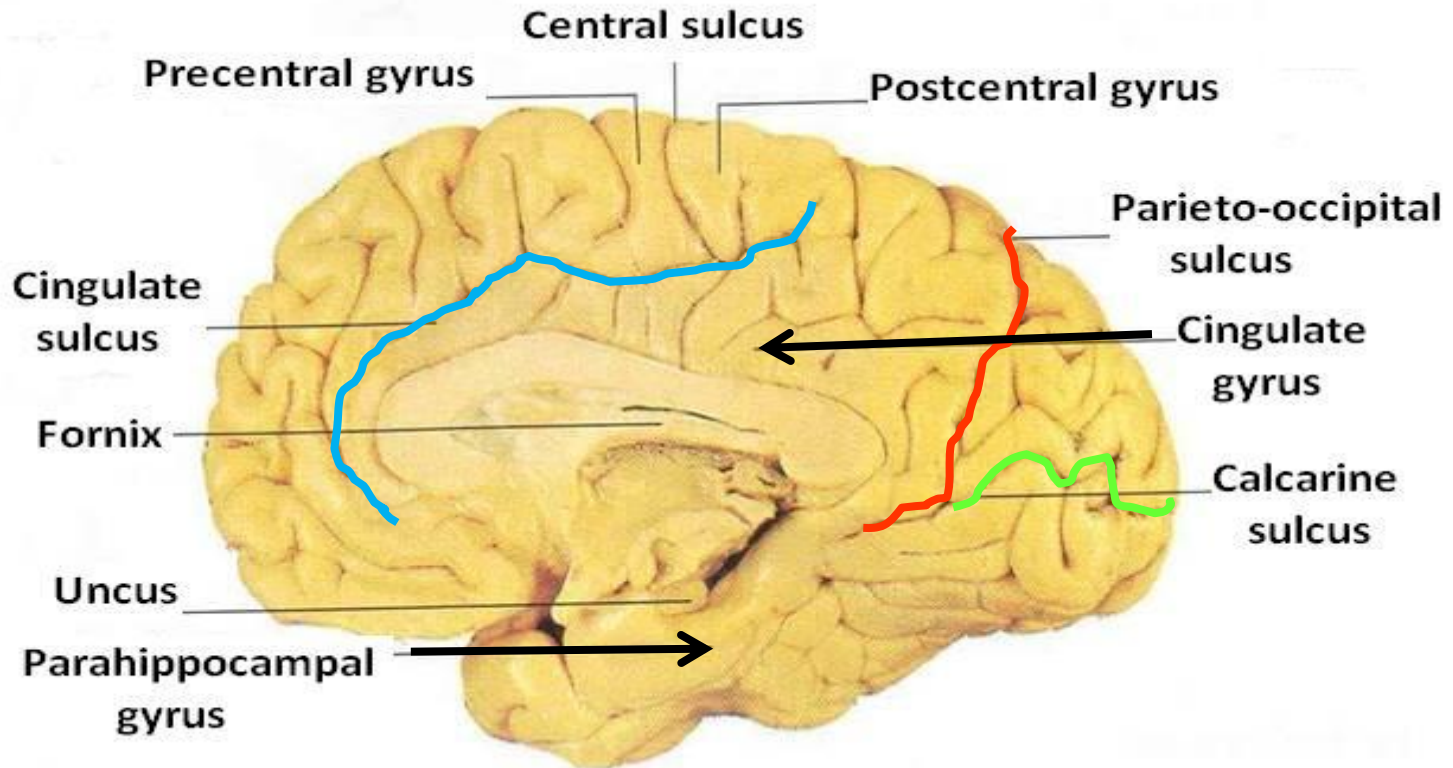
❑ Temporal lobe:

- **Superior & inferior temporal sulci** giving rise to superior, middle & inferior temporal gyri.
- **Insula:** the gyrus in the depth of lateral sulcus, covered by parts of frontal, parietal & temporal lobes called the **opercula** (removed in lower picture.).



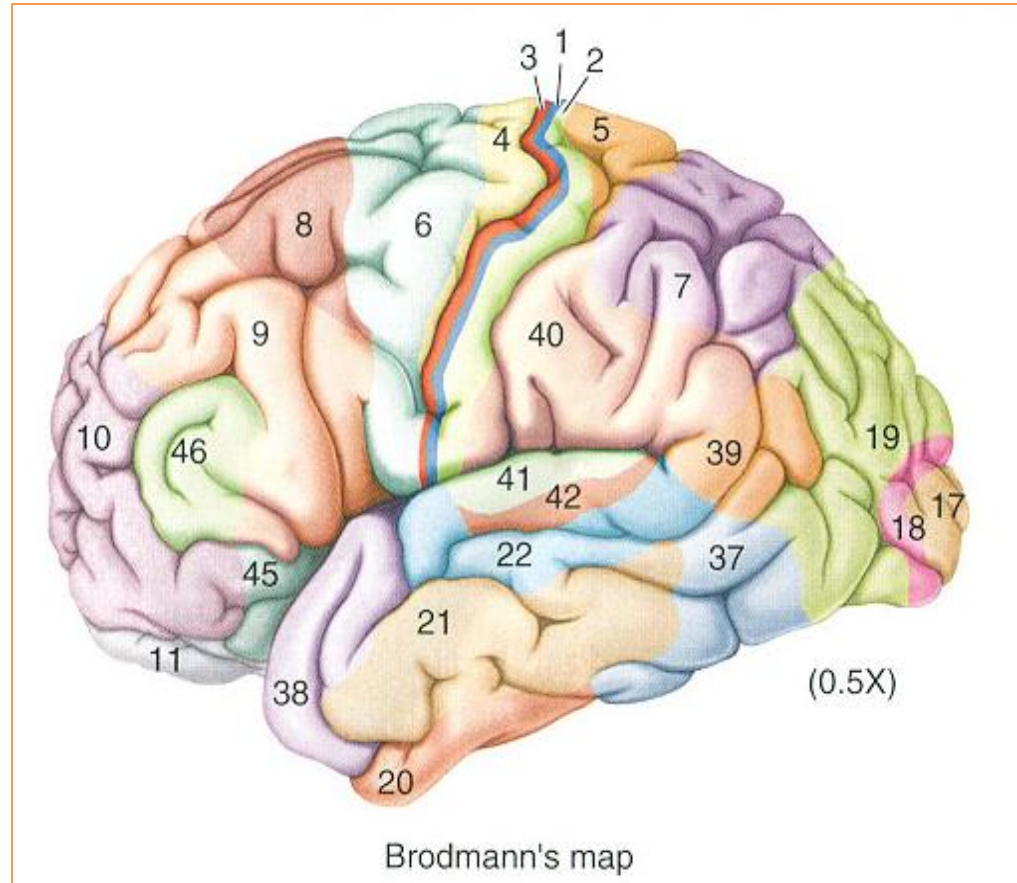
# MEDIAL SURFACE

- **Sulci: Parietooccipital, Calcarine, Cingulate**
- **Gyri: Cingulate, Parahippocampal**



# BRODMANN'S MAP

- **Brodmann** produced a **numbered, cytological map** of cerebral cortex based upon its regional histological characteristics.
- Subdivisions with **similar cellular and laminar structure** are called **'areas'**
- Brodmann's numbering of these cortical locations has become one of the standard ways to identify brain areas.



# **FUNCTIONAL AREAS OF THE CEREBRAL CORTEX**



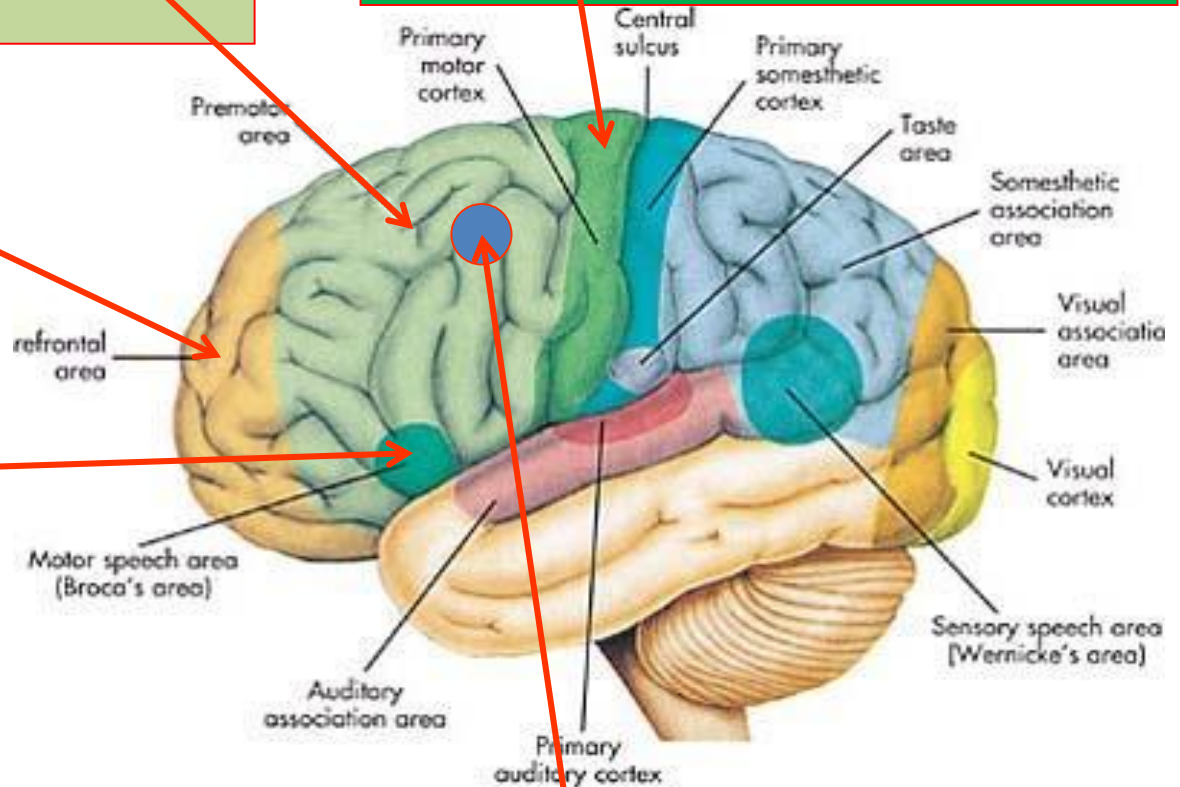
# FRONTAL LOBE

**Premotor cortex:** Located in the region immediately anterior to the precentral gyrus (**Brodmann's area 6**).

**Prefrontal cortex:** Extensive region of the frontal lobe anterior to premotor area.

**Broca's (motor speech) area:** Located in the inferior frontal gyrus of the dominant hemisphere, usually left (**Brodmann's area 44 & 45**).

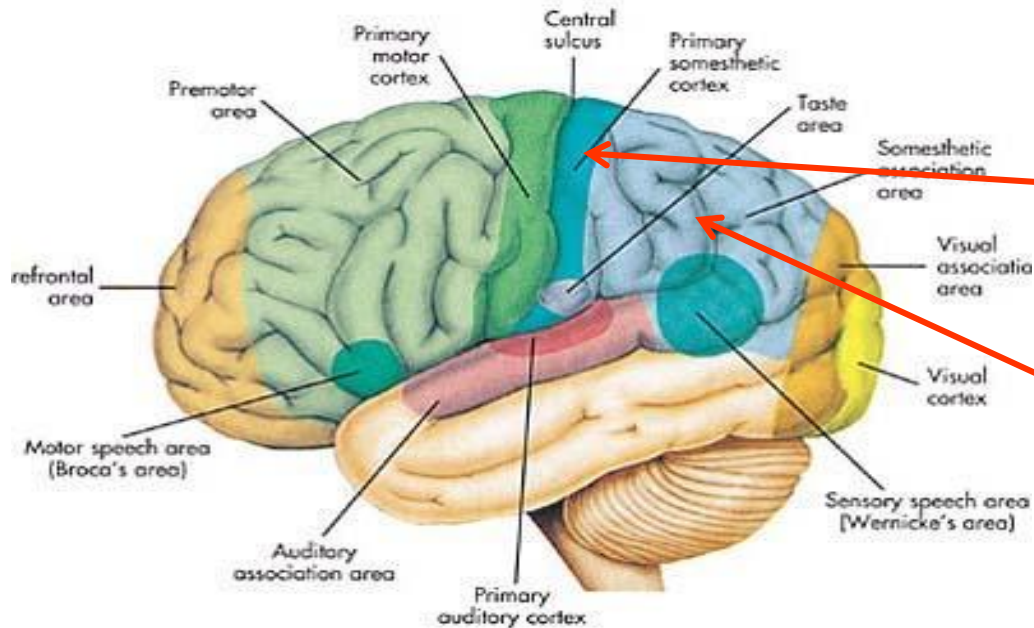
**Primary motor cortex:** Located in precentral gyrus (**Brodmann area 4**).



**Frontal eye field:** Located in the middle frontal gyrus immediately in front of motor cortex (**Brodmann's area 8**).



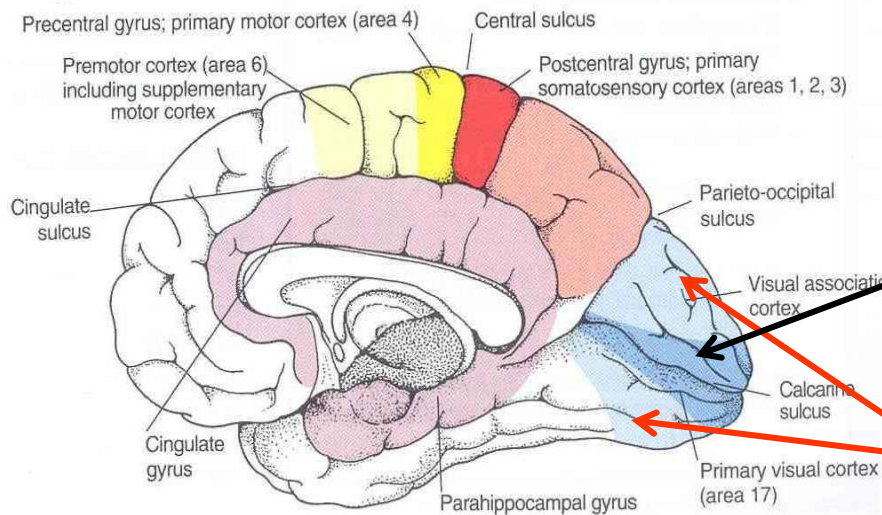
# PARIETAL LOBE



**Primary somatosensory cortex:** located in postcentral gyrus (Brodmann's area 1, 2, 3).

**Parietal association cortex:** located posterior to primary somatosensory cortex.

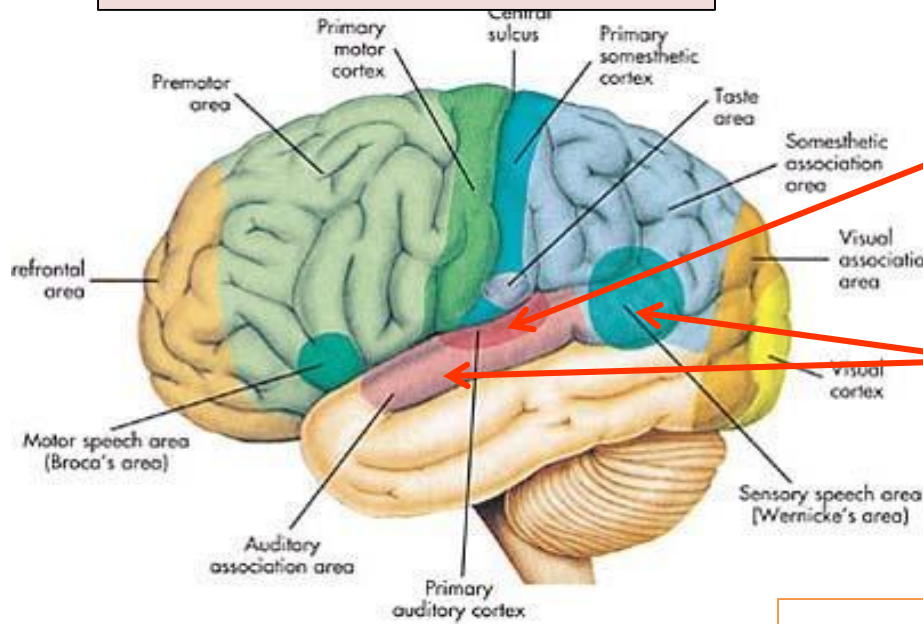
# Occipital lobe



**Primary visual cortex:** located on the medial surface of the hemisphere, in the gyri surrounding the calcarine sulcus (**Brodmann's area 17**).

**Visual association cortex:** located around the primary visual cortex. **Area 19**

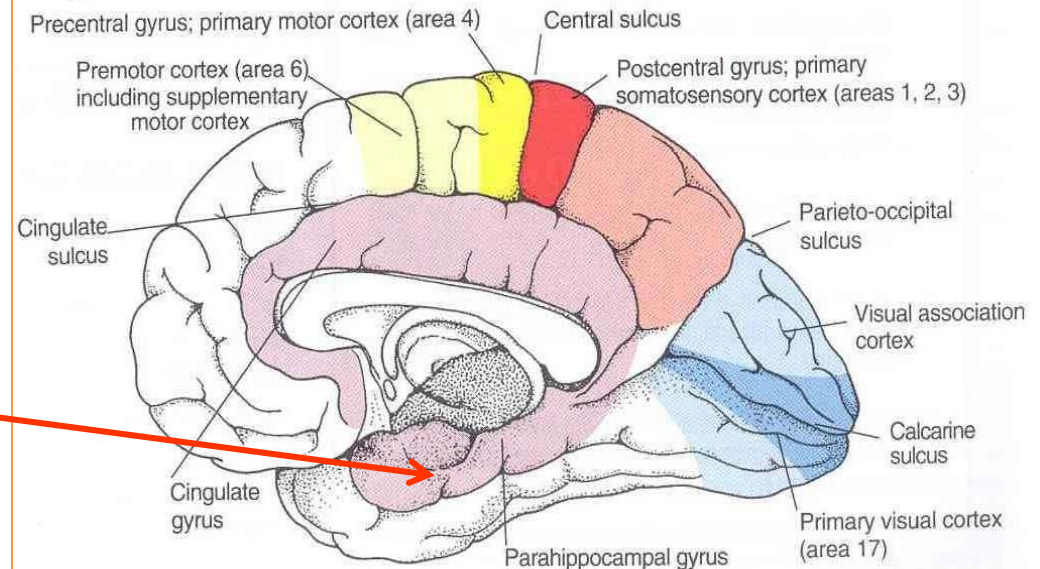
# TEMPORAL LOBE

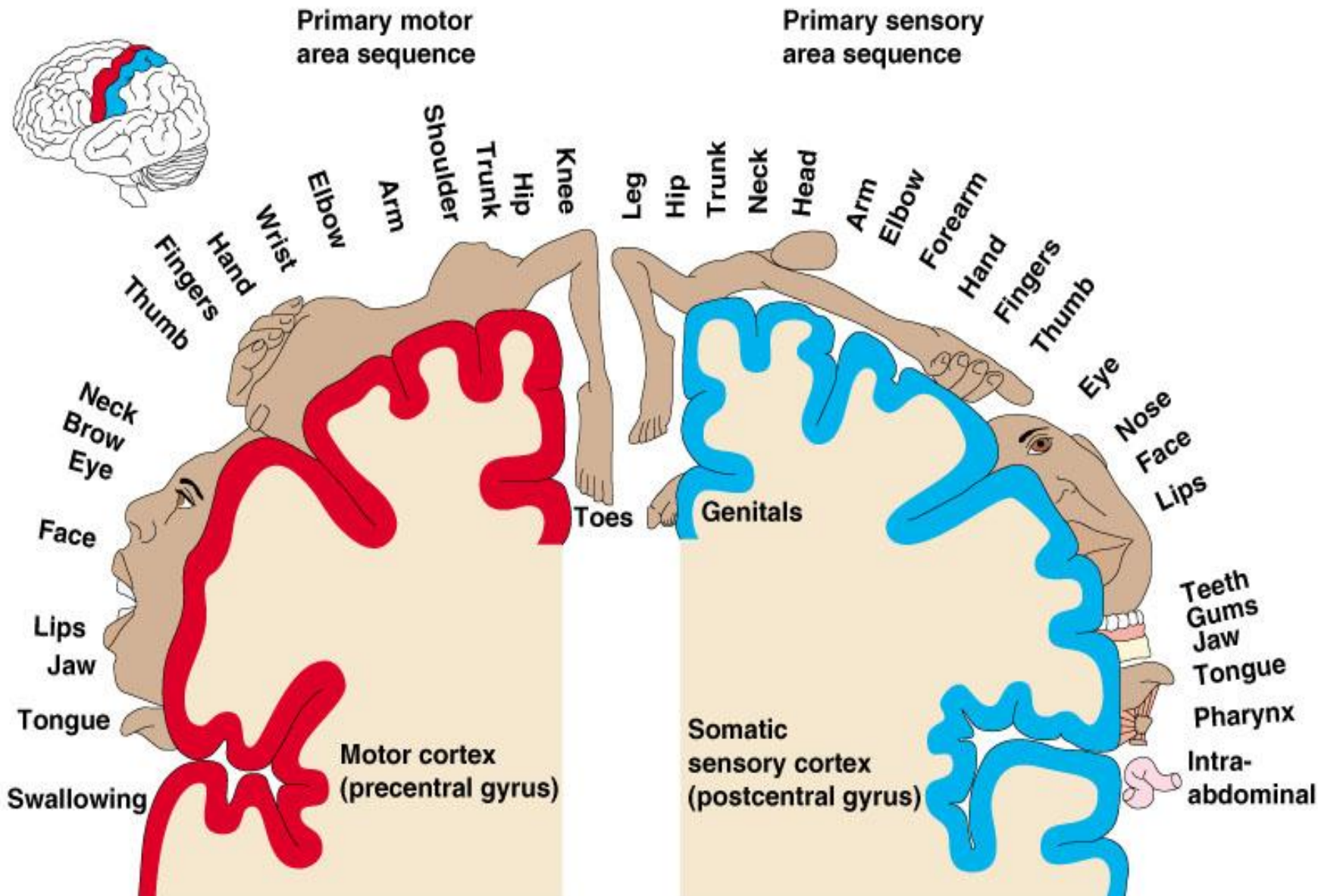


**Primary auditory cortex:** located in the superior surface of the superior temporal gyrus (**Brodmann's area 41, 42**)

**Auditory association cortex:** located immediately around the primary auditory cortex (also includes **Wernick's area**)

**Parahippocampal gyrus:** located in the inferomedial part of temporal lobe. Deep to this gyrus lies the **hippocampus and the amygdala**, which are parts of limbic system

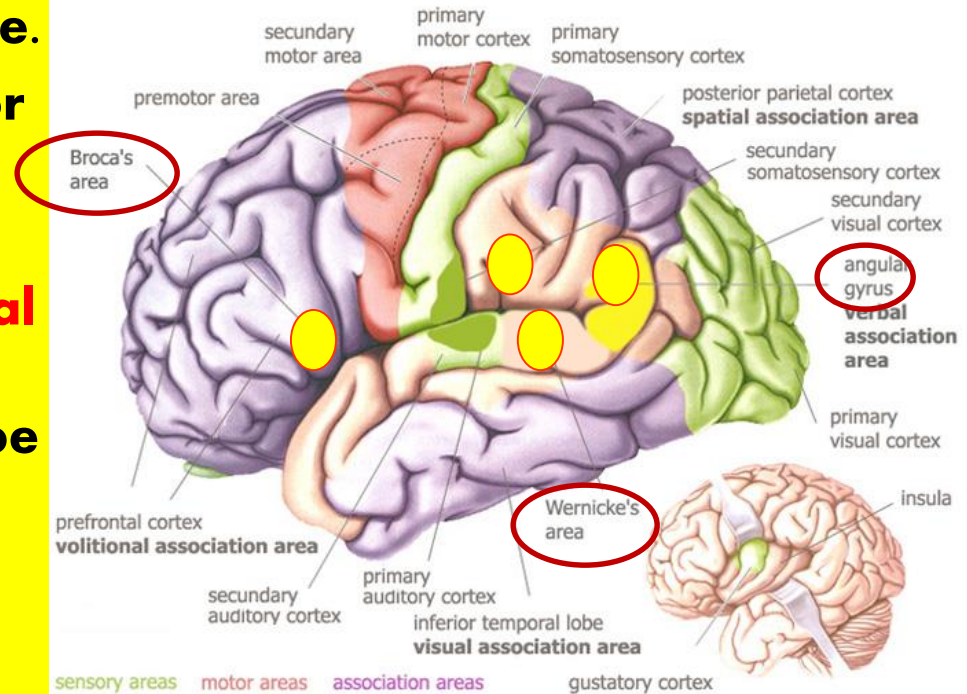






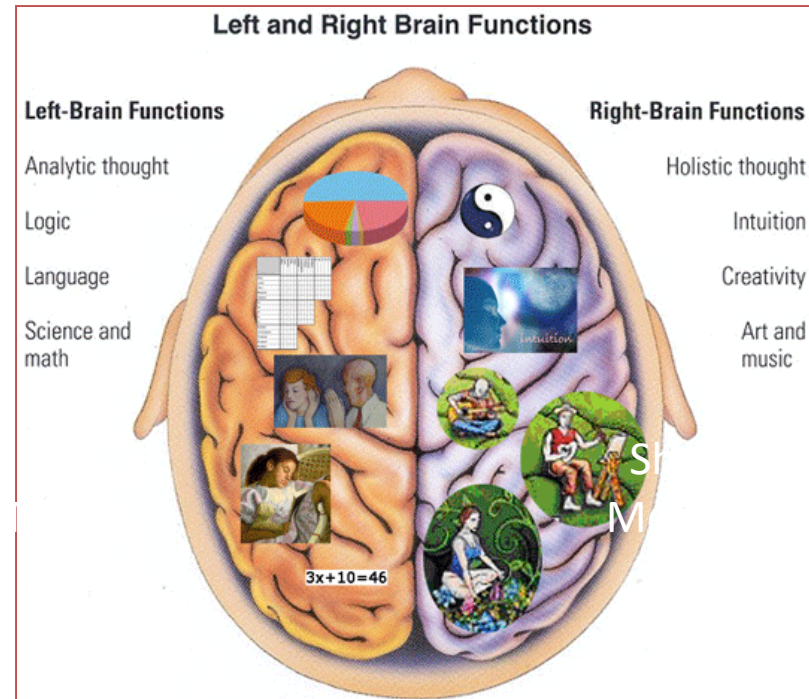
# LANGUAGE AREAS

- Organized around the lateral Sulcus.
- **Broca's area:** concerned with expressive aspects of language.
- **Wernick's area:** responsible for comprehension of the spoken words.
- **Angular gyrus & Supramarginal gyrus:** nearby regions of temporal lobe and parietal lobe (the inferior parietal lobule) are important in naming, reading, writing, and calculation.



# HEMISPHERIC DOMINANCE

- The localization of **Speech centers & Mathematical ability** is the criterion for defining the dominant cerebral hemisphere.
- In **96% of normal right-handed individuals and 70% of normal left-handed individuals**, the **Left hemisphere contains the language centers**. These are **Left Hemisphere Dominant**.
- Cerebral dominance becomes established during the first few years after birth.



**Hemispheres communicate via the corpus callosum**



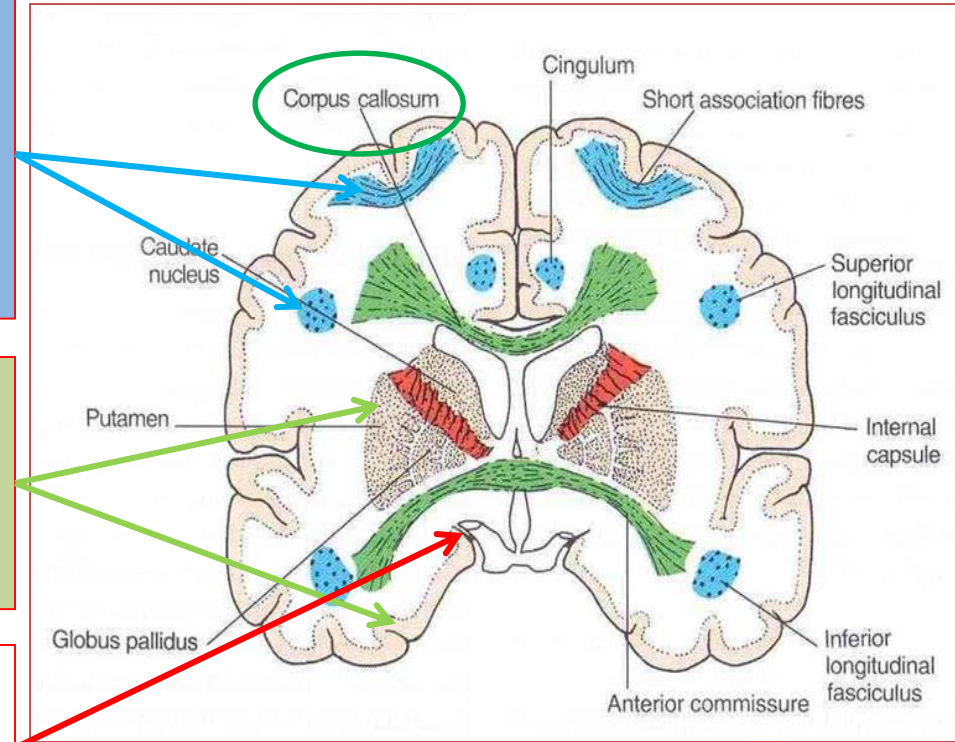
# WHITE MATTER

- Underlies the cortex, contains nerve fibers, neuroglia cells and blood vessels.
- The nerve fibers originate, terminate or sometimes both, within the cortex.
- Depending on their origin & termination, these nerve fibers are classified into three types: **Association, Projection & Commissural**

**Association fibers:** Unite different parts of the same hemisphere, are of two types: long & short

**Commissural fibers:** Connect the corresponding regions of the two hemispheres

**Projection fibers:** Consist of afferent and efferent fibers of the cerebral cortex



**THANK YOU & GOOD LUCK**