Anatomy Team
MED 439

Revised & Approved

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MED439
KING SAUD UNIVERSITY

Anatomy of the Cerebral hemisphere

CNS Block

Don't forget to check the Editing File

Color index:

Content
Male slides
Female slides
Important
Doctors notes
Extra information, explanation

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Objectives

At the end of the lecture, students 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.

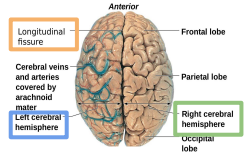
Cerebrum

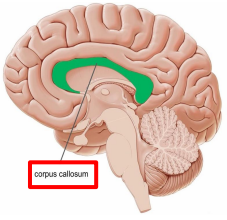
Cerebrum

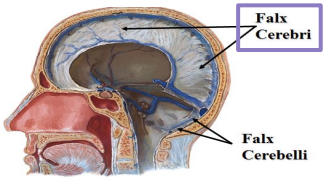
Largest part of the forebrain.

Divided into two halves: **Right** and **left** 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**.







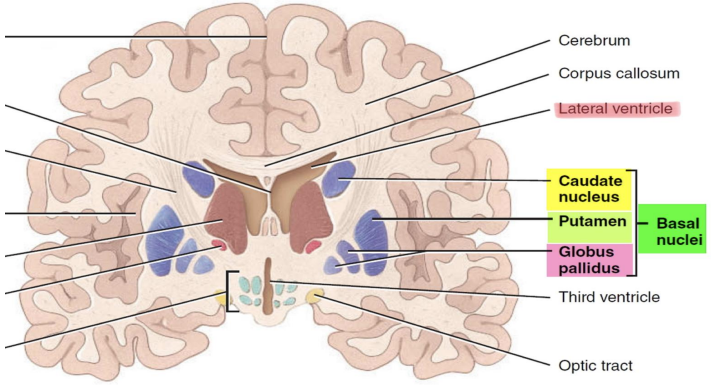
Structure of cerebrum

Cerebral cortex

Superficial layer of grey matter.

Medulla (White Matter)

Deeper to the cortex, contains axons to and from the cells of the cortex.



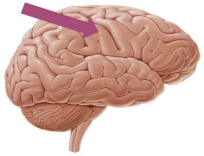
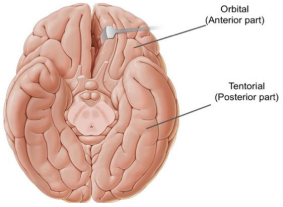
Basal ganglia

Number of nuclear masses buried within the white matter

Lateral ventricle

The cavity of hemisphere.

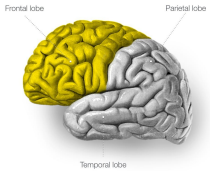
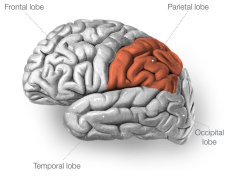
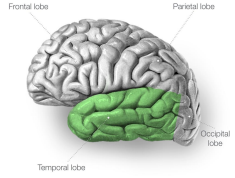
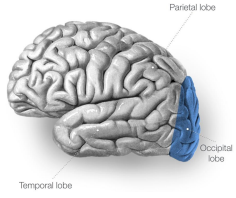
Surfaces of Cerebrum :

1. Superolateral 
2. Medial 
3. Inferior(tentorial)
   (the inferior is subdivided into orbital and tentorium) 

Lobes of Cerebrum and their function:

- The superficial layer of grey matter is highly convoluted to form a complex pattern of ridges (**gyri**) and grooves (**sulci**).
- This arrangement maximize the surface area of the cerebral cortex (about 70% is hidden within the depths of sulci).
- **Three sulci**, consistent in position, named as: **central, lateral (sylvian) & parieto-occipital**.
- These sulci divide each hemisphere into **FOUR lobes** (named after overlying bones)**:**
  Functionally each hemisphere contains a **'limbic lobe'** on the medial surface.

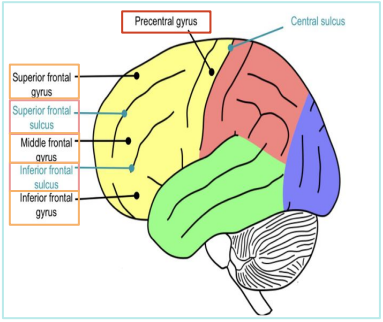
Dr.TAHNI note:
You have to know the functions in general

	Frontal Lobe	Parietal Lobe	Temporal Lobe	Occipital Lobe	Limbic lobe
Function	**1-Motor function** **2-Motivation** **3-Aggression** **4-Smell** **5-Mood** 	Reception and evaluation of sensory information 	**1-smell** **2-hearing** **3-memory** **4-abstract thought** 	visual processing 	1- emotional 2-memory storage 3-Linking conscious intellectual functions with the unconscious autonomic functions 

Important Gyri and sulci of the cerebrum

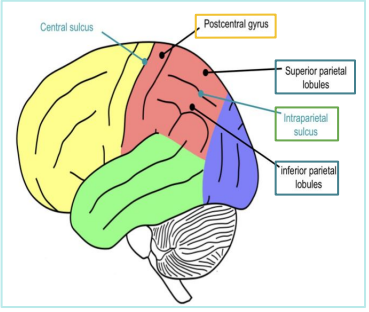
Frontal Lobe
(MAIN GYRI IN SUPEROLATERAL SURFACE)

- **Gyrus:** **Precentral gyrus**. (Contain motor cortex)
- **Sulcus:** **Superior & inferior frontal sulci** divide the lobe into **superior, middle & inferior frontal gyri**.



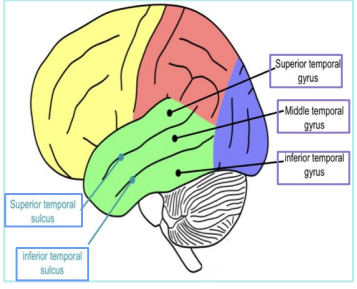
Parietal Lobe
(MAIN GYRI IN SUPEROLATERAL SURFACE)

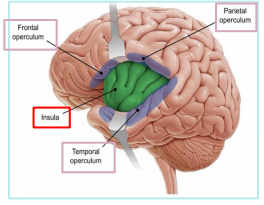
- **Gyrus:** **Postcentral gyrus**. (Contain somatosensory cortex)
- **Sulcus:** **Intraparietal sulcus** divide the lobe into **superior & inferior parietal lobules**.



Temporal Lobe

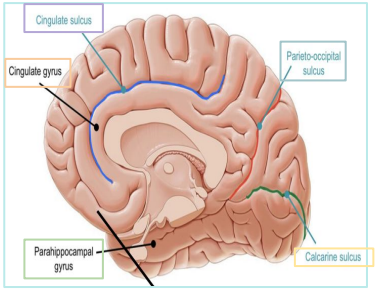
- **Sulcus:** **Superior & inferior temporal sulci** giving rise to: **superior, middle & inferior temporal gyri**.
- **Insula**: the gyrus in the depth of lateral sulcus, covered by parts of **frontal, parietal & temporal lobes called the opercula.**





Medial Surface

- **Gyrus:** Cingulate gyrus cortex, Parahippocampal gyrus
- **Sulcus:** 1-Parieto Occipital. 2-Calcarine. 3-Cingulate.



Brodmann's Map :

01

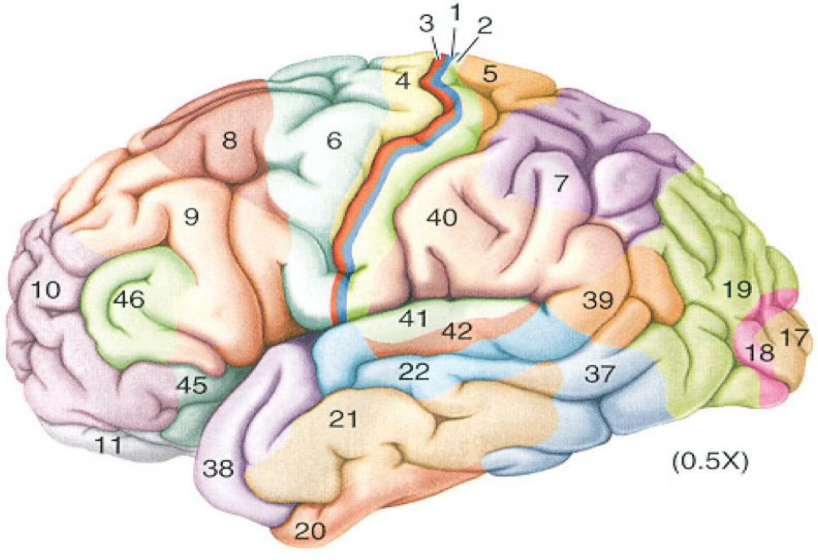
Brodmann produced a numbered, cytological map of cerebral cortex based upon its regional histological characteristics

02

Brodmann's numbering of these cortical locations has become one of the standard ways to identify brain areas.

03

Subdivisions with similar cellular and laminar structure are called 'areas'.



Brodmann's map

Functional Areas of cerebral cortex

Dr.TAHNI note: The numbers of the areas that have been mentioned are IMPORTANT

Frontal lobe

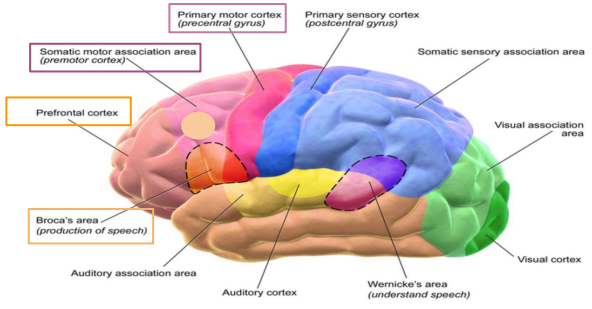
1-Primary motor cortex : located in precentral gyrus (**Brodmann's area 4**).
(#438: Injury will lead to Hemiplegia)

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

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

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

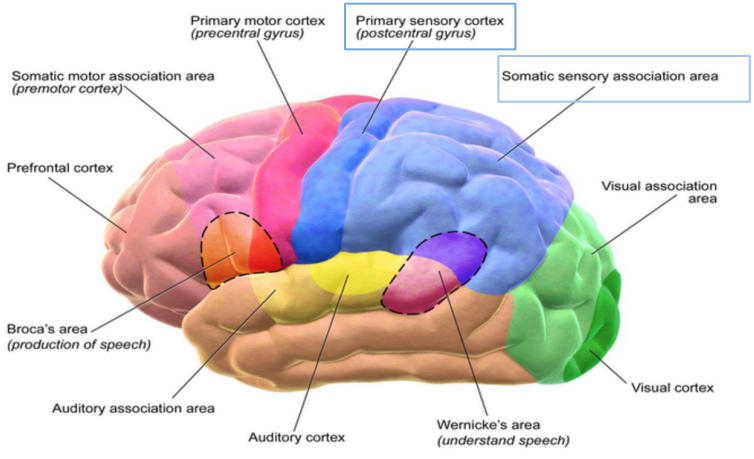
5-Frontal eye field : Located in the middle frontal gyrus immediately in front of motor cortex (**Brodmann's area 8**).



Parietal lobe

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

2-Parietal association Cortex:
located posterior to primary somatosensory cortex.

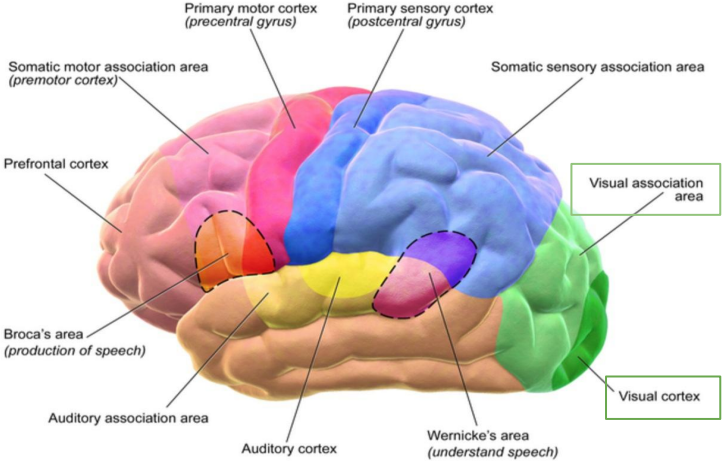


Functional Areas of cerebral cortex

Occipital lobe

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

2-Visual association cortex:
located around the primary visual cortex(**Brodmann's area 19**).



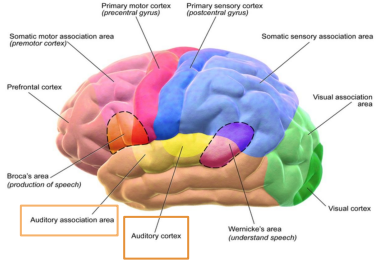
Temporal lobe

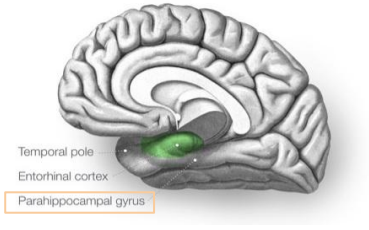
1-Primary auditory cortex:
located in the superior surface of the superior temporal gyrus (**Brodmann's area 41&42**).

2-Auditory association cortex:
located immediately around the primary auditory cortex , also includes **Wernicke's area** (#438:Brodmann's area 22) 22,39,40)

3-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.**

Dr's note: They call it upside down Representation the means the organ closest to the ground like the toes is present in the upper most part & vica versa





Functional Areas of cerebral cortex

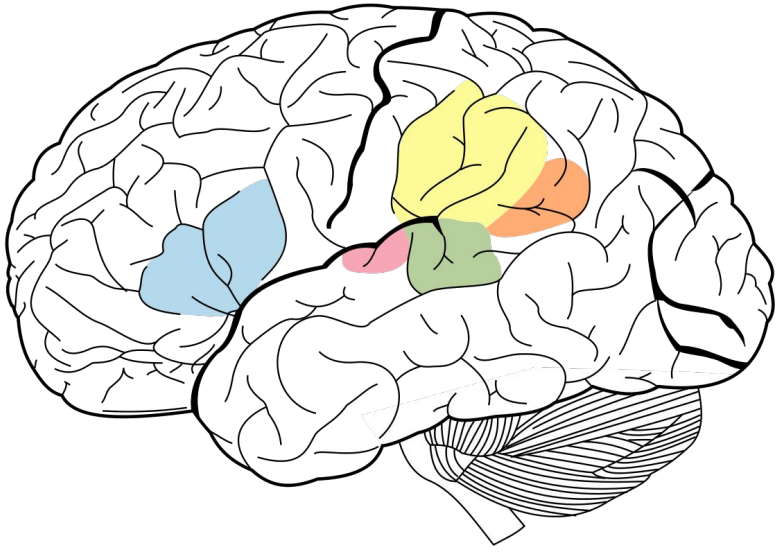
Language Areas

Organized around the **lateral sulcus**.

1- Broca's area: Concerned with expressive aspects of language.

2- Wernicke's area: Responsible for comprehension of the spoken words.

3- Angular gyrus & supramarginal gyrus :
-Nearby regions of temporal lobe and parietal lobe of the inferior parietal lobule.
-Are important in naming, reading, writing, and calculation.



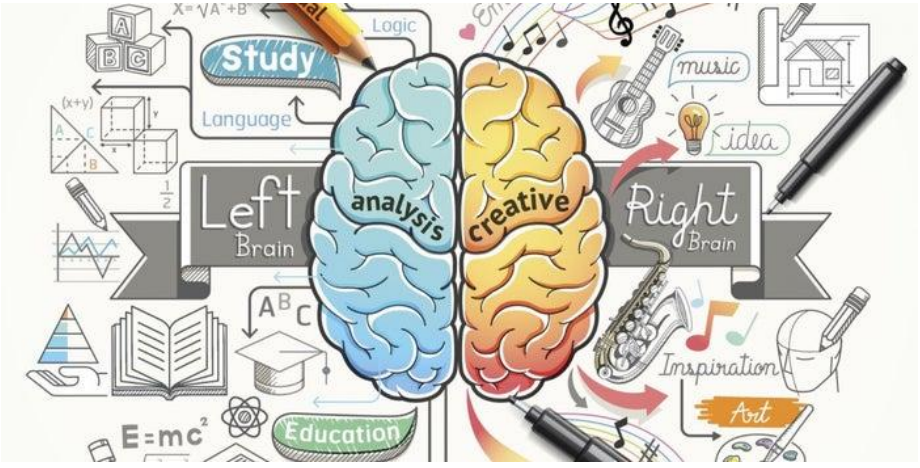
Hemispheric Dominance

Male slides only

- 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.

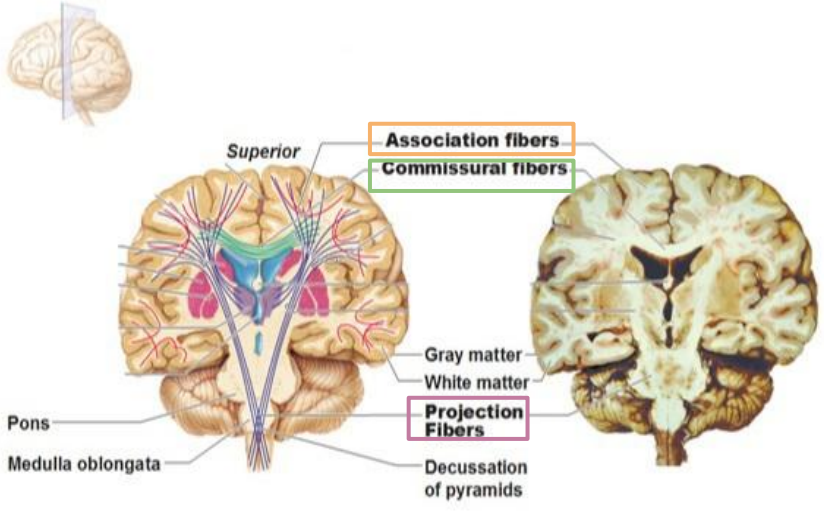
- Cerebral dominance becomes established during **the first few years after birth**.



Functional Areas of cerebral cortex: White matter

Underlies the cortex. Contain

- **Nerve fibers**
- **Neuroglia cells**
- **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:

1-Association fibers

-Unite different parts of the same hemisphere.
-Are of two types: long & short
#438 - Examples:
Arcuate fibers (short), they interconnect gyri within the same lobe
Longitudinal fibers (long): connect the frontal lobe with other lobes

2-Commissural fibers

-Connect the corresponding regions of the two hemispheres
-Examples: Corpus Callosum and Anterior White Commissure

3-Projection fibers

Consist of:
-Consist of afferent & efferent fibers of the cerebral cortex.
-Afferent fibers conveying impulses to the cerebral cortex.
-Efferent fibers conveying impulses away from the cortex.
-Example: Internal Capsule

MCQ

Q1: Cerebrum is the largest part of;			
A: Midbrain	B: Forebrain	C: Mesencephalon	D: Hindbrain

Q2: Which lobe is responsible for smell, hearing and memory?			
A: Temporal	B: Frontal	C: Parietal	D: Occipital

Q3: The hemispheres connected to each other by:			
A: Corpus Callosum	B: Median longitudinal fissure	C: Filum Terminale	D: White matter

Q4: Precentral gyrus located in:			
A: Occipital Lobe	B: Parietal Lobe	C: Temporal Lobe	D: Frontal Lobe

Q5: Lobe responsible for visual processing:			
A: Temporal Lobe	B: Parietal Lobe	C: Occipital Lobe	D: Frontal Lobe

Q6: The Cingulate gyrus found in:			
A: Parietal lobe.	B: Lateral surface of cerebrum.	C: Frontal lobe.	D: Medial surface of cerebrum.

Answer key:
1 (B) , 2 (A) , 3 (A) , 4 (D) , 5 (C) , 6 (D)

MCQ

Q7: Which of the following is a part of temporal lobe ?			
A: Primary somatosensory cortex.	B: Brodmann's area. 6.	C: Primary auditory cortex.	D: Brodmann's area 17.

Q8: Which of the following located in postcentral gyrus ?			
A: Primary motor cortex.	B: Brodmann's area 1,2,3 .	C: Primary somatosensory cortex.	D: B & C

Q9: Primary auditory cortex located in ……..			
A: Poscentral gyrus .	B: Precentral gyrus .	C: Brodmann's area 41&42 .	D: Brodmann's area 19 .

Q10: Broca's area of language area concerned with …..			
A: Reading , writing and naming .	B: Expressive aspect of language.	C: Comprehension of spoken words	D: None

Q11: Cerebral dominance becomes established during …..			
A: The first few years after birth.	B: The first few days after birth.	C: The first few months after birth	D: The first few weeks after birth

Q12: Underlies the cortex contains ….			
A: Blood vessels	B: Nerve fibers	C: Neuroglia cells	D: All are correct

Answer key:
7(C) , 8(D) , 9(C) , 10(B) , 11(A) , 12(D)

SAQ

Q1: What is the function of frontal lobe?

Q2: What is Brodmann's Map?

Q3:Enumerate the parietal lobe parts and where they are located .

Q4: Projection fibers consist of ...

Answers

1 : 1-Motor function 2-Motivation 3-Aggression 4-Smell 5-Mood

2 : Slide Number 5

3 : Slide Number 7

4:
-Afferent fibers conveying impulses to the cerebral cortex.
-Efferent fibers conveying impulses away from the cortex.

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