External features of cerebral hemispheres

By:
Dr. Dina Badawi
Department of human Anatomy and Embryology
Faculty of Medicine
Mansoura National University, Egypt

Intended Learning Outcomes (ILOs)

1. Identify the external features of the cerebral hemispheres.
2. Recognize the sulci of each surface of the cerebral hemispheres.
3. Identify the gyri of each surface of the cerebral hemispheres.

Agenda

1. What are the external features of cerebral hemispheres?
2. What are the sulci of cerebral hemispheres?
3. What are the gyri of cerebral hemispheres?

Cerebral Hemisphere

3 Poles

4 Major Sulci

3 surfaces

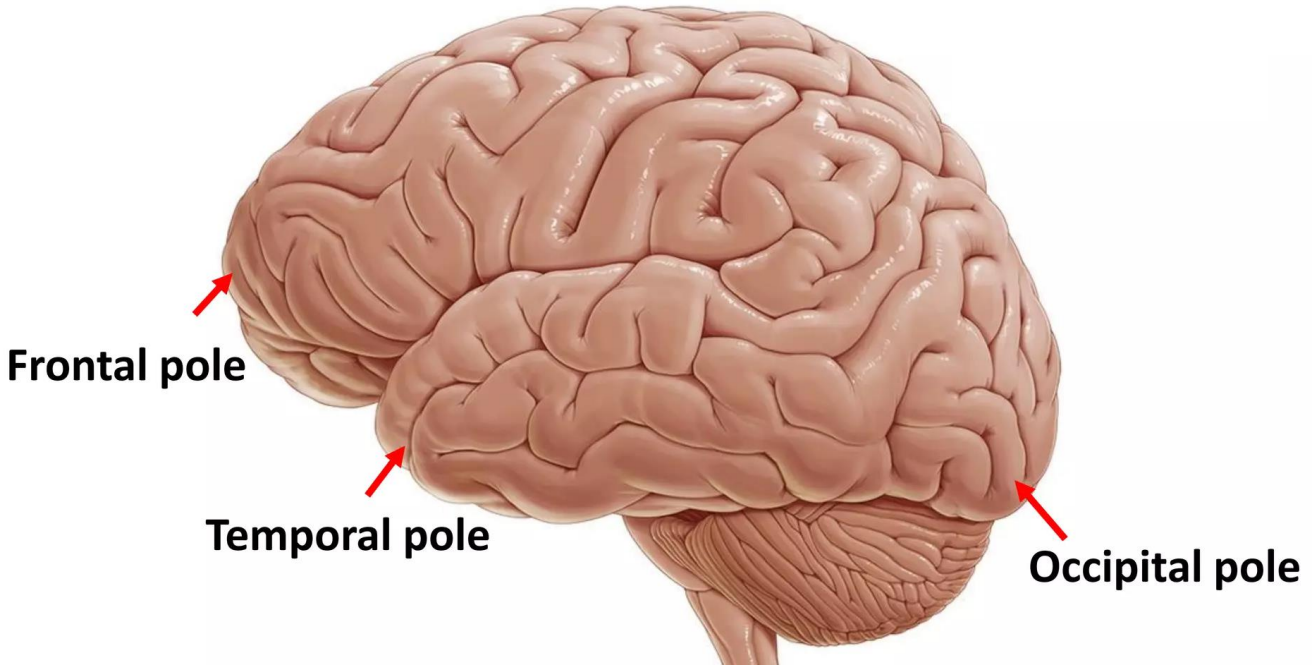
Each cerebral hemisphere has:

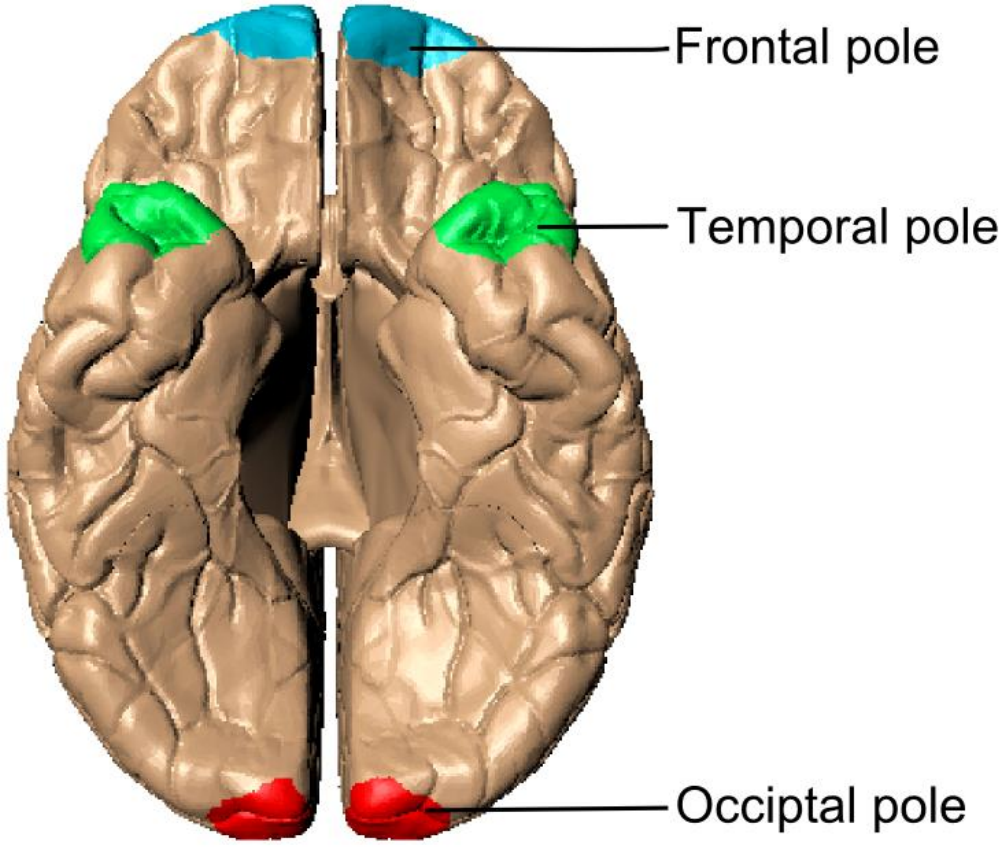
3 Borders

4 Lobes

Cerebral Hemisphere

3 Poles:



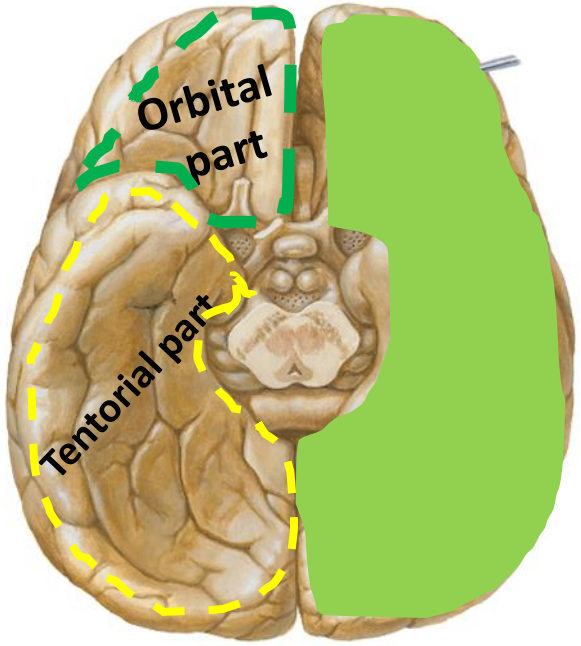


Cerebral Hemisphere

3 Surfaces:

Lateral (superolateral) surface

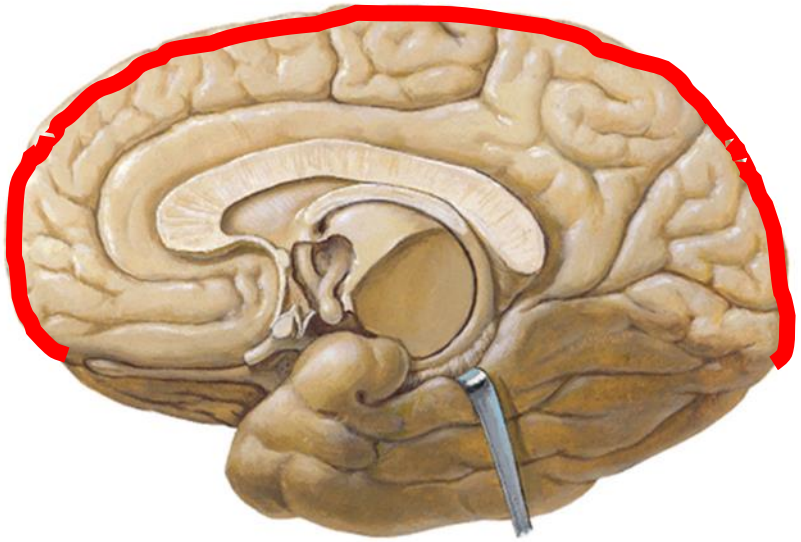
Medial surface



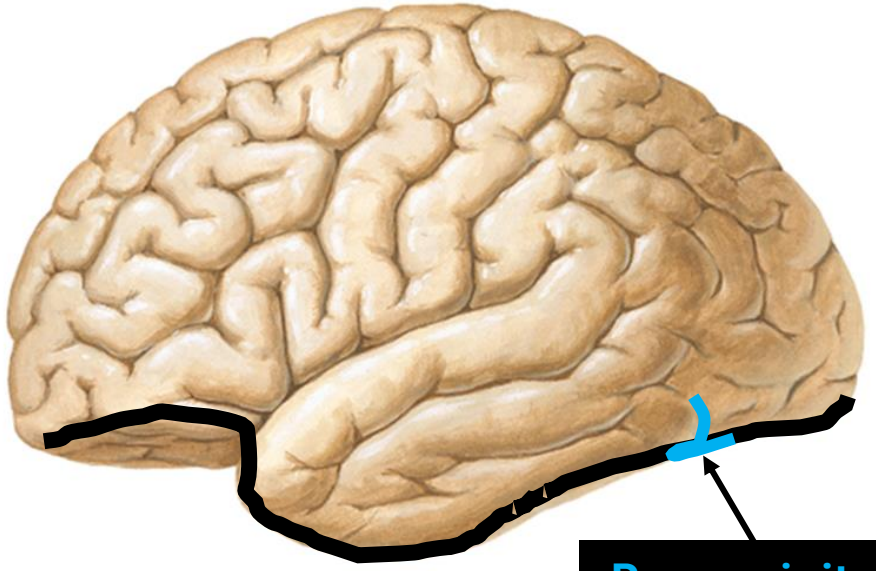
Inferior surface:

Cerebral Hemisphere

3 Borders:



Superior border

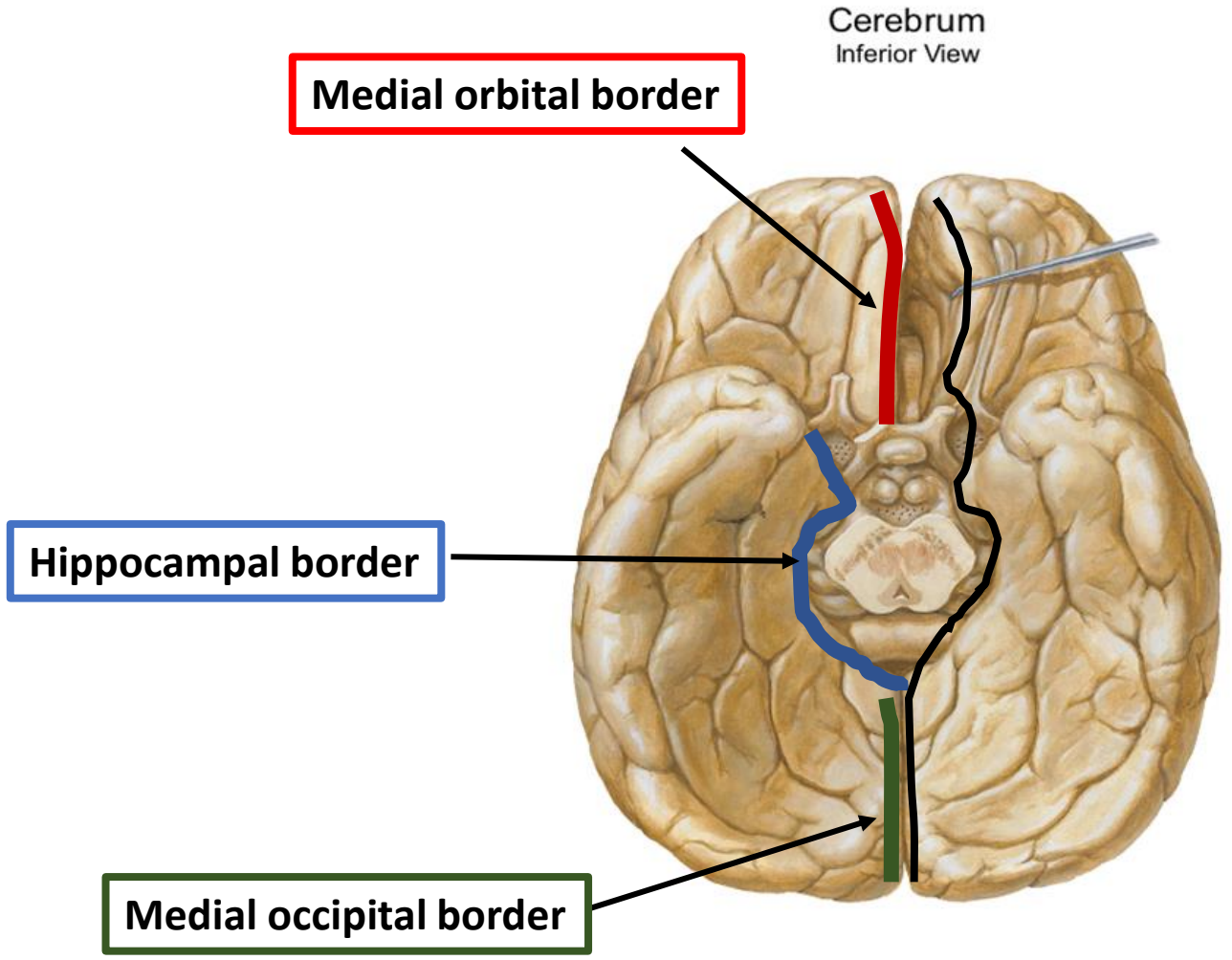


Inferolateral border

Cerebral Hemisphere

3 Borders:

Inferomedial border



Cerebral Hemisphere

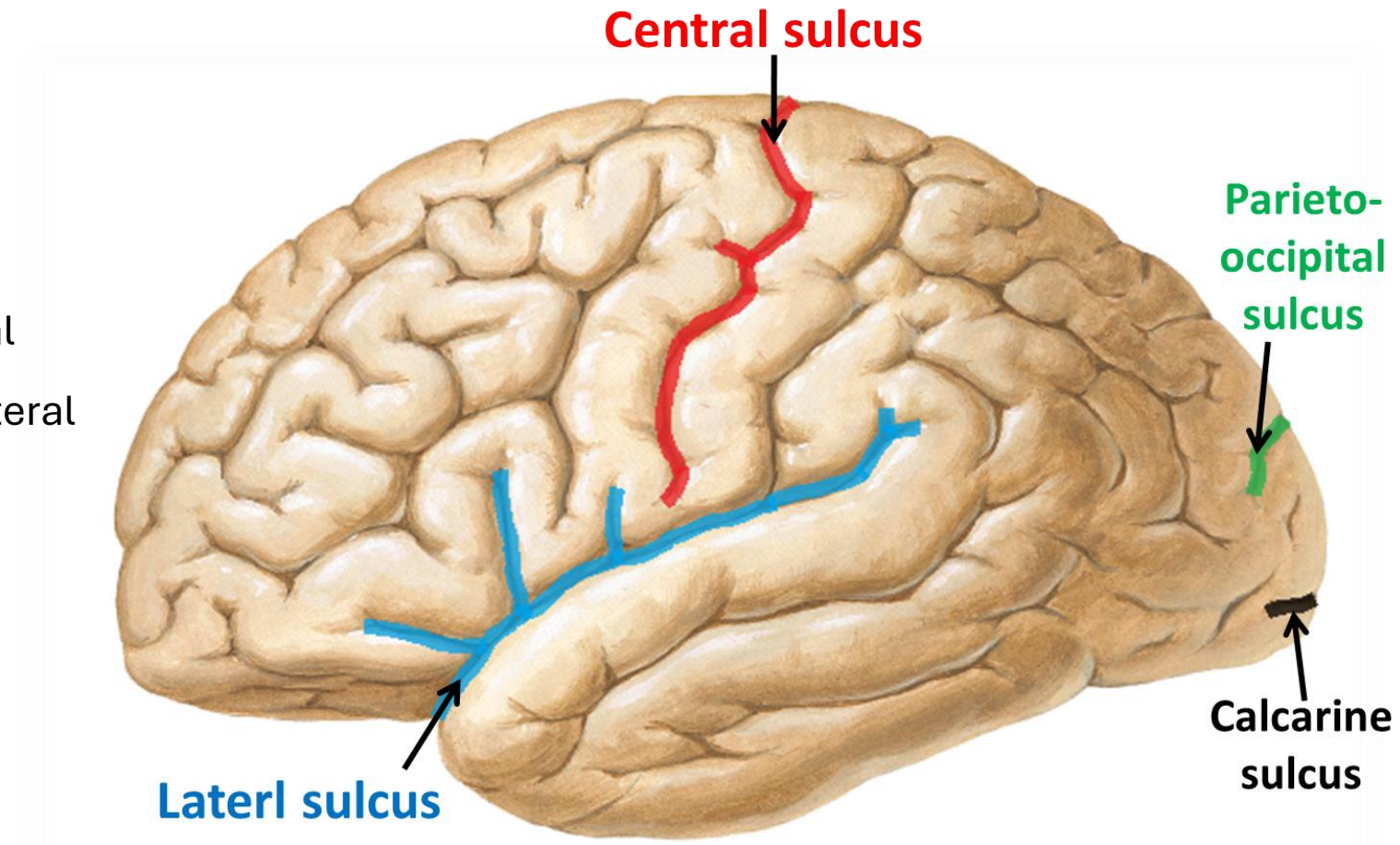
4 major sulci:

Central sulcus

It runs downward across the lateral surface 1cm behind the midpoint between the frontal and occipital poles. It ends just above the lateral sulcus.

Calcarine sulcus

Parieto-occipital sulcus



Cerebral Hemisphere

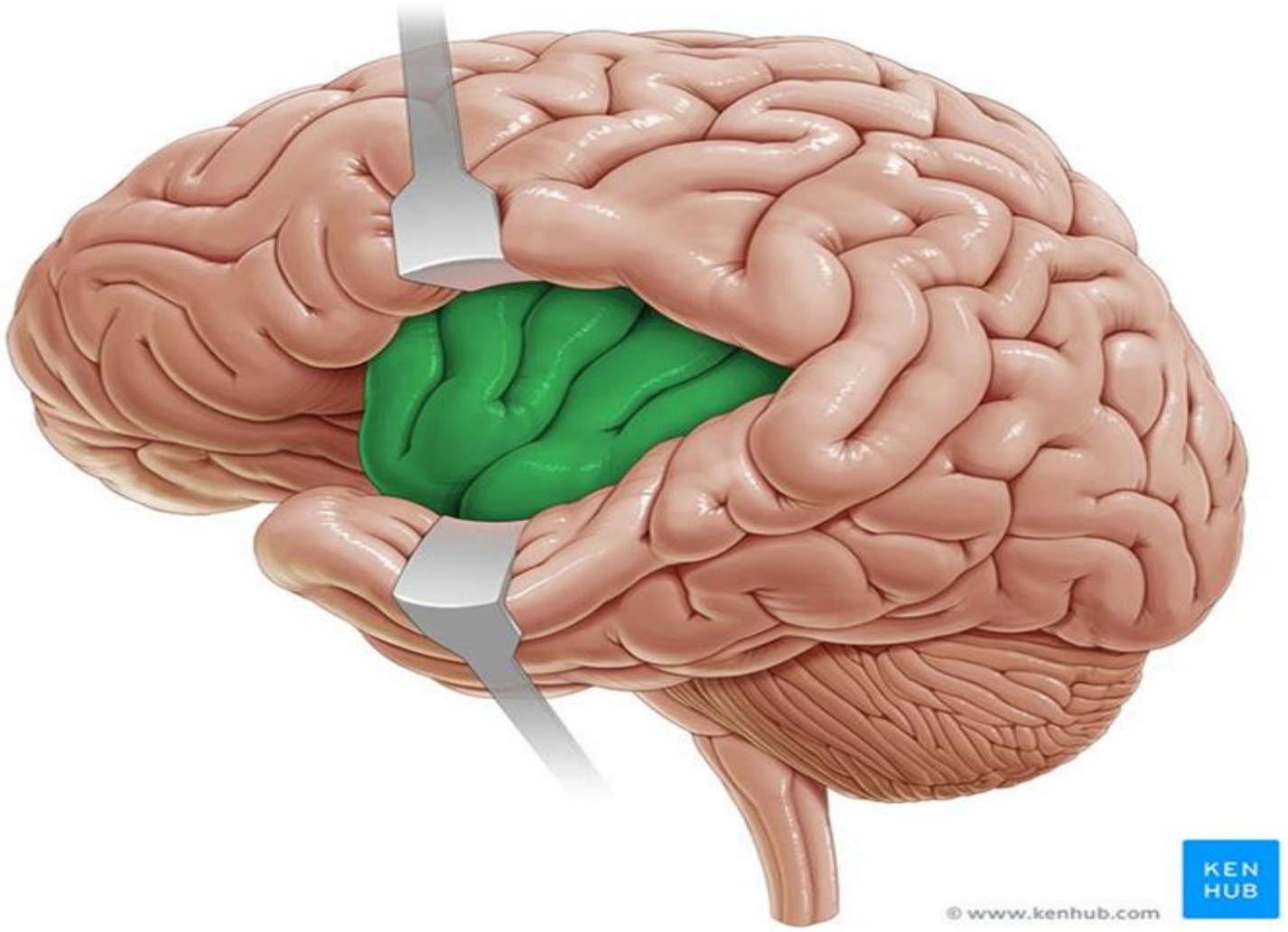
4 major sulci:

Lateral sulcus

It consists of a **short stem** and **3 rami**:

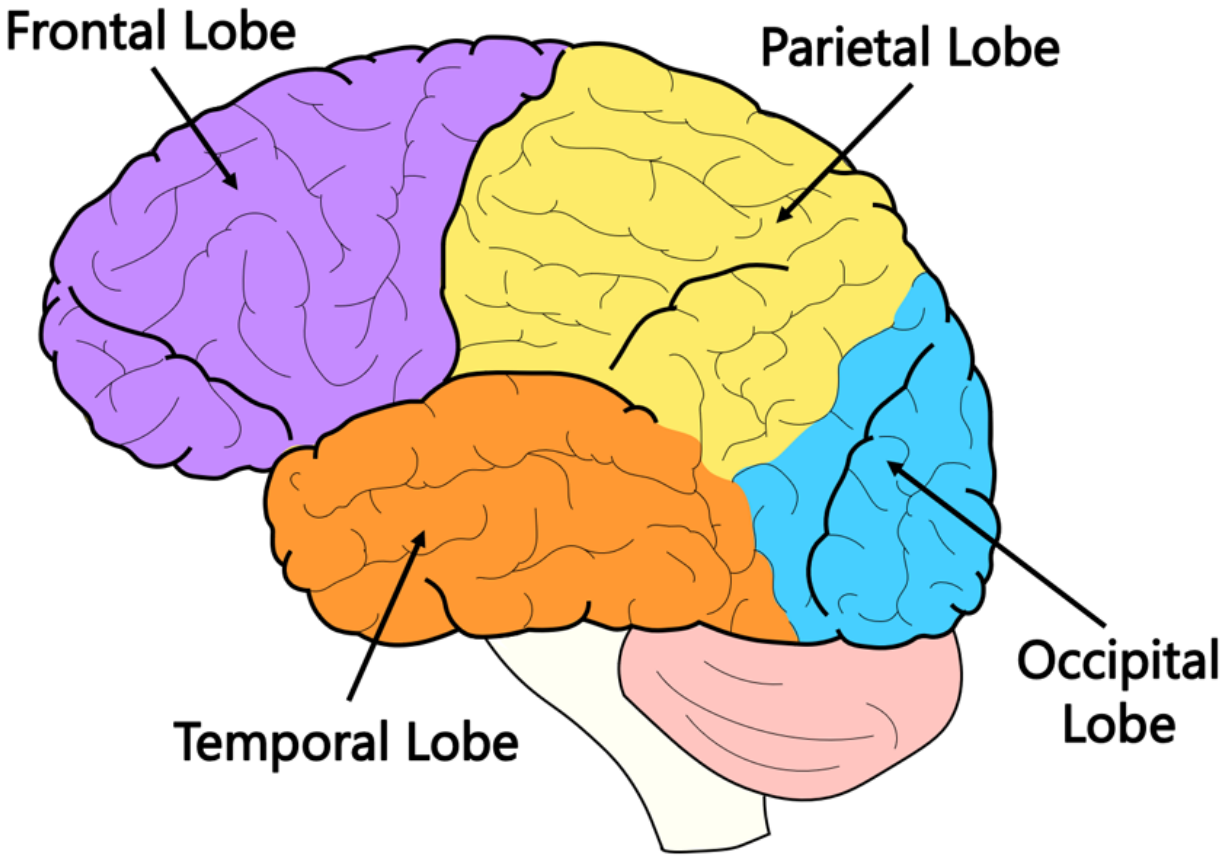
- anterior ramus
- ascending ramus
- posterior ramus.

The area of the cortex that lies at the bottom of the lateral sulcus is called the **insula**



Cerebral Hemisphere

4 Lobes:



Cerebral Hemisphere

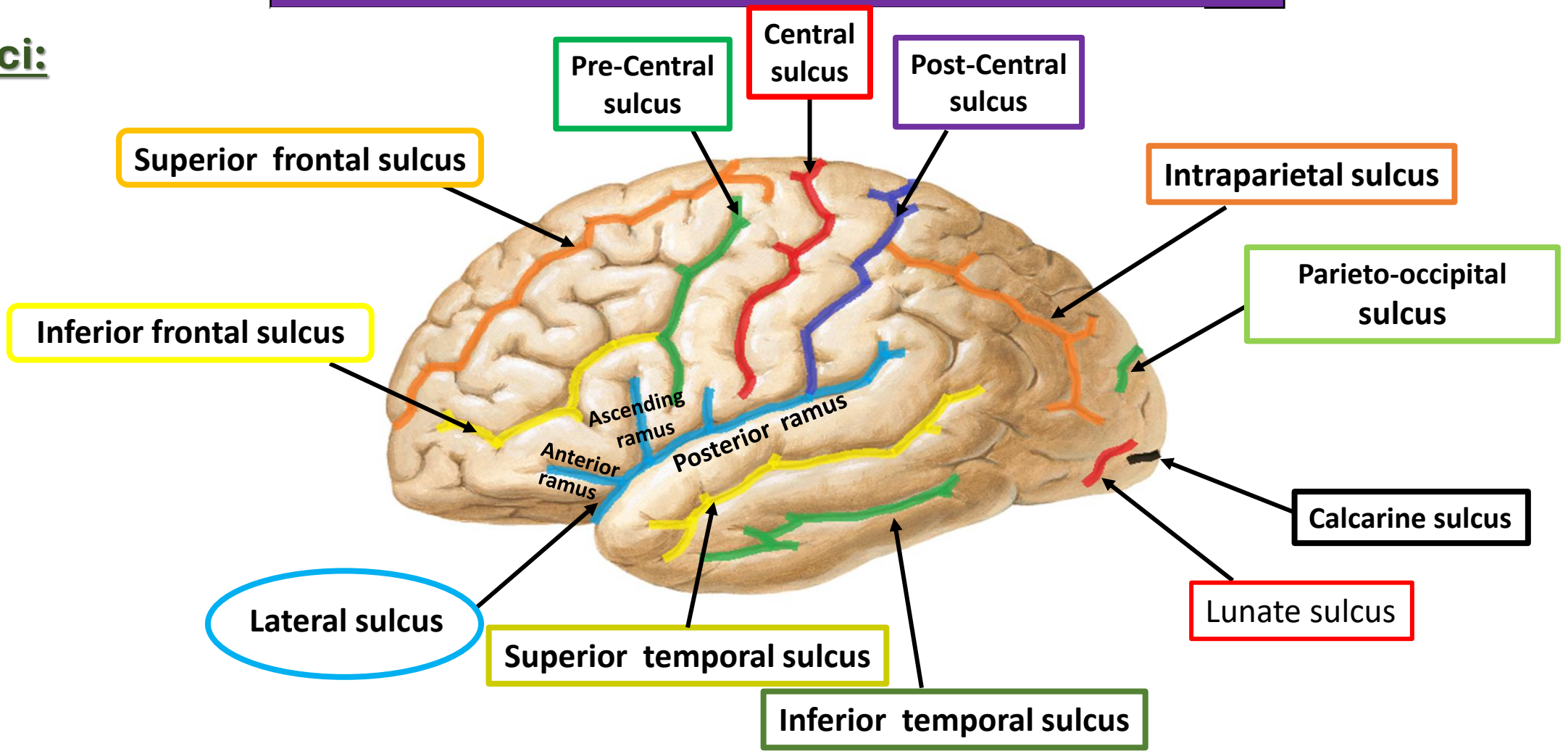
The superolateral surface

- **Sulci:**

1. **Central sulcus:** 1cm behind the midpoint between the frontal and occipital poles.
2. **Precentral sulcus:** in front and parallel to the central sulcus.
3. **Postcentral sulcus:** behind and parallel to the central sulcus.
4. **Three rami of the lateral sulcus:** anterior ramus, ascending ramus and posterior ramus.
5. **Two frontal horizontal sulci:** superior and inferior frontal sulci.
6. **Two temporal horizontal sulci:** superior and inferior temporal sulci**.**
7. **Intraparietal sulcus:** extends posteriorly from the middle of the postcentral sulcus.
8. **Parieto-occipital sulcus** and **calcarine sulcus:** extend from the medial surface.
9. **Sulcus lunatus:** curved sulcus surrounding the end of the calcarine sulcus.

Cerebral Hemisphere

- **Sulci:**



Cerebral Hemisphere

The superolateral surface

- **Gyri :**

1. Precentral gyrus: lies between the central and precentral sulci.

2. Postcentral gyrus: lies between the central and postcentral sulci.

3. Three frontal gyri:

a. Superior frontal gyrus: lies above the superior frontal sulcus.

b. Middle frontal gyrus: lies between the superior and inferior frontal sulci.

c. Inferior frontal gyrus: lies below the inferior frontal sulcus. It is divided into 3 parts by the anterior and ascending rami of the lateral sulcus:

i. Opercular part: behind the ascending ramus.

ii. Triangular part: between the ascending ramus and the anterior ramus.

iii. Orbital part: below the anterior ramus.

4. Three temporal gyri:

a. Superior temporal gyrus: above the superior temporal sulcus.

b. Middle temporal gyrus: between the superior and inferior temporal sulci.

c. Inferior temporal gyrus: below the inferior temporal sulcus.

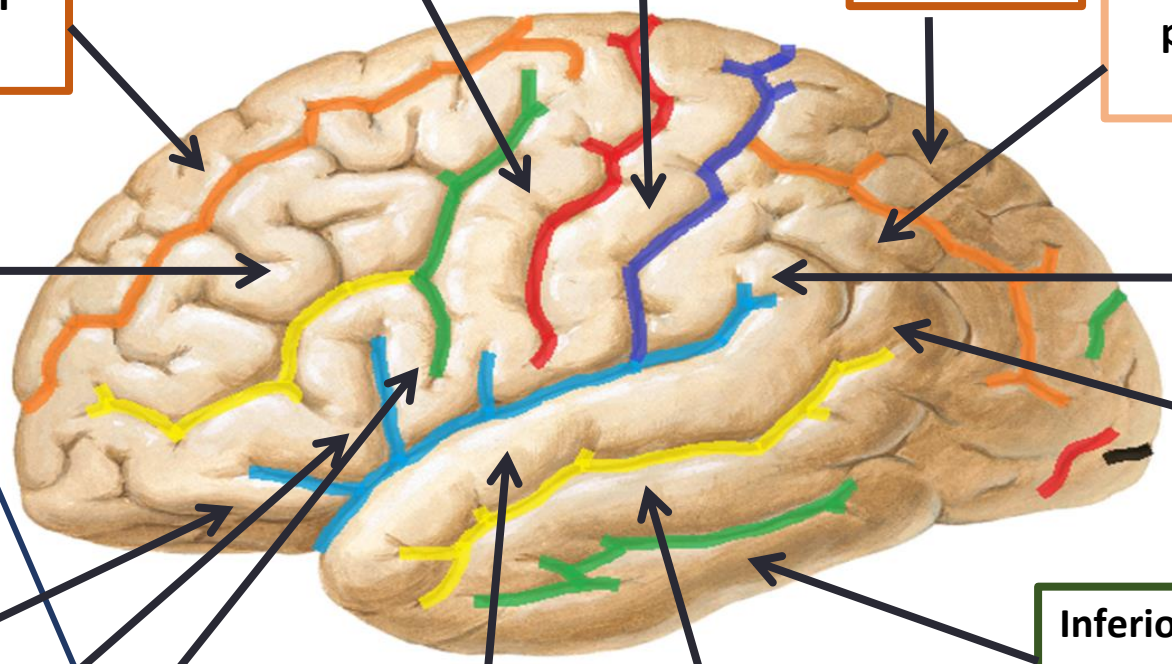
5. Superior parietal lobule: above the intraparietal sulcus.

6. Inferior parietal lobule: below the intraparietal sulcus. It is divided into:

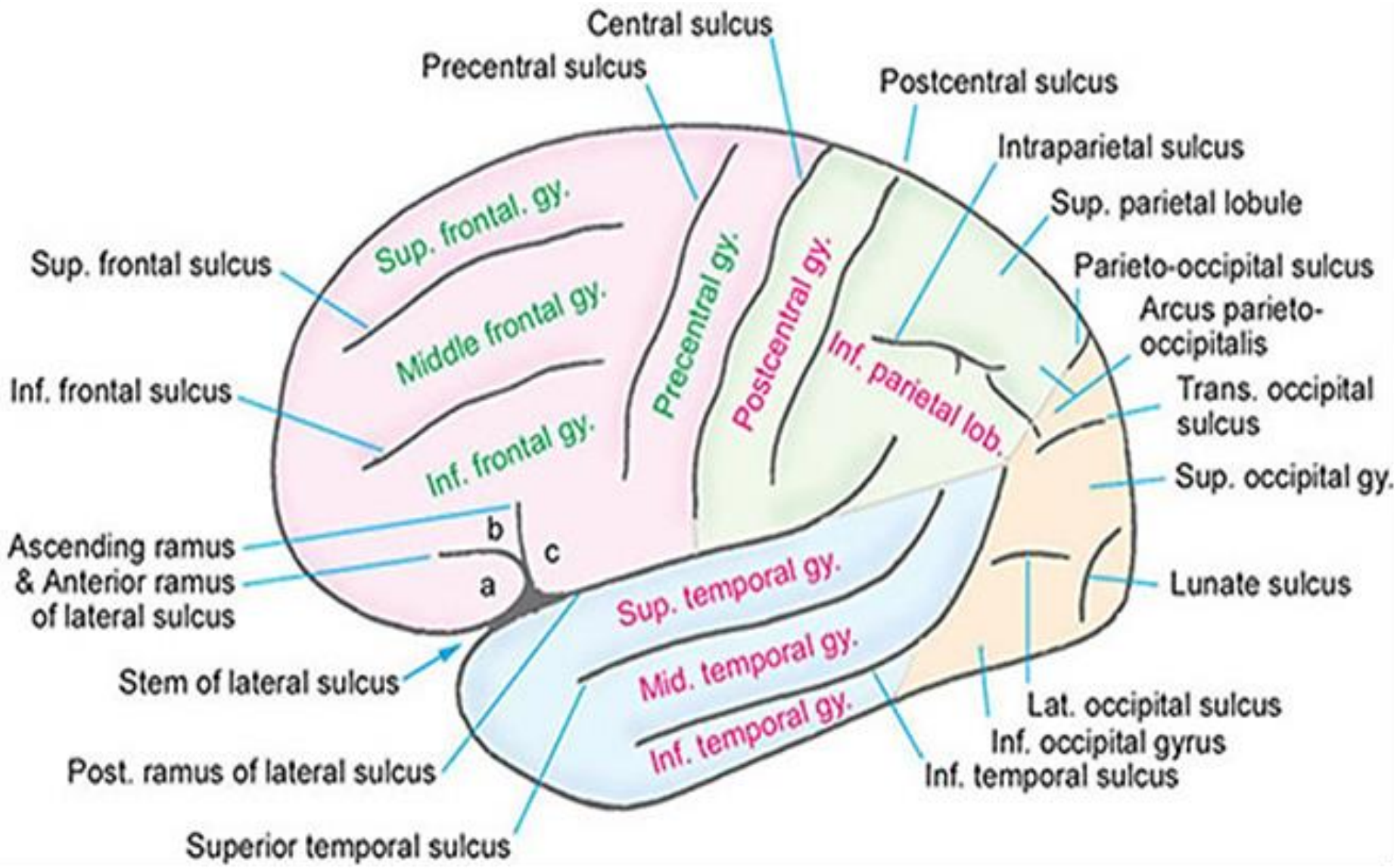
a. Supramarginal gyrus: surrounds the posterior end of the lateral sulcus.

b. Angular gyrus: surrounds the posterior end of the superior temporal sulcus

Cerebral Hemisphere



Superior frontal gyrus
Precentral gyrus
Postcentral gyrus
Superior parietal lobule
Inferior parietal lobule
middle frontal gyrus
Supra-marginal gyrus
Angular gyrus
Inferior frontal gyrus
Orbital part
Triangular part
Opercular part
Superior temporal gyrus
Middle temporal gyrus
Inferior temporal gyrus


Central sulcus
Precentral sulcus
Postcentral sulcus
Intraparietal sulcus
Sup. parietal lobule
Parieto-occipital sulcus
Arcus parieto-occipitalis
Trans. occipital sulcus
Sup. occipital gy.
Lunate sulcus
Lat. occipital sulcus
Inf. occipital gyrus
Inf. temporal sulcus
Sup. frontal sulcus
Inf. frontal sulcus
Ascending ramus & Anterior ramus of lateral sulcus
Stem of lateral sulcus
Post. ramus of lateral sulcus
Superior temporal sulcus
Sup. frontal. gy.
Middle frontal gy.
Inf. frontal gy.
Precentral gy.
Postcentral gy.
Inf. parietal lob.
Sup. temporal gy.
Mid. temporal gy.
Inf. temporal gy.
a
b
c

Cerebral Hemisphere

The superolateral surface

- **Cortical areas in frontal lobe:** (all the motor areas)

❖ **Primary motor area (area 4):**

Site: in the precentral gyrus, anterior wall of the central sulcus and extends into the anterior part of the paracentral lobule.

❖ **Premotor area (area 6):**

Site: Anterior to the primary motor area

❖ **Frontal eye field area (area 8):**

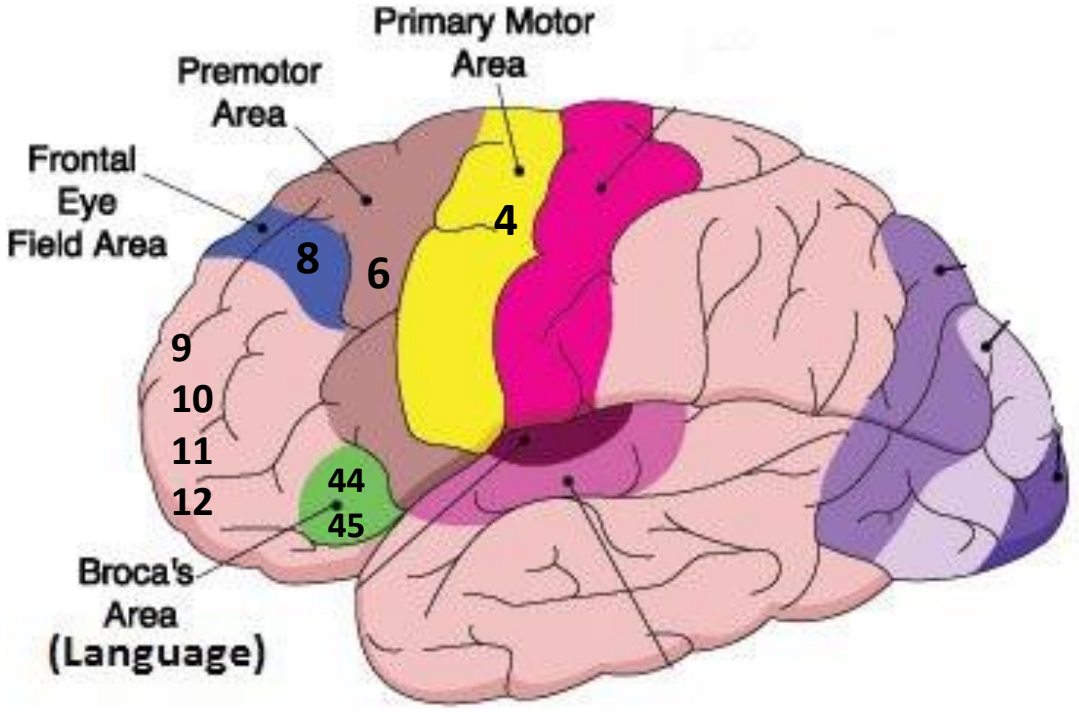
Site: Middle frontal gyrus.

❖ **Motor speech area (Broca's area, areas 44 & 45):**

Site: Inferior frontal gyrus of the dominant hemisphere: Opercular & triangular gyri.

❖ **Personality Center (Areas 9, 10, 11 & 12):**

Site: frontal pole.



Cerebral Hemisphere

The superolateral surface

- **Cortical areas in Parietal Lobe:**

❖ **General (somatic) sensory area (areas 3, 1, 2):**

Site: lies in the postcentral gyrus, posterior wall of the central sulcus and the posterior part of the paracentral lobule.

❖ **Somatosensory association area (areas 5, 7 & 40):**

Site:

- ✓ **(areas 5, 7):** Superior parietal lobule.
- ✓ **(Area 40):** Supramarginal gyrus

❖ **Primary taste area (area 43):**

Site: Lower end of the general sensory area.

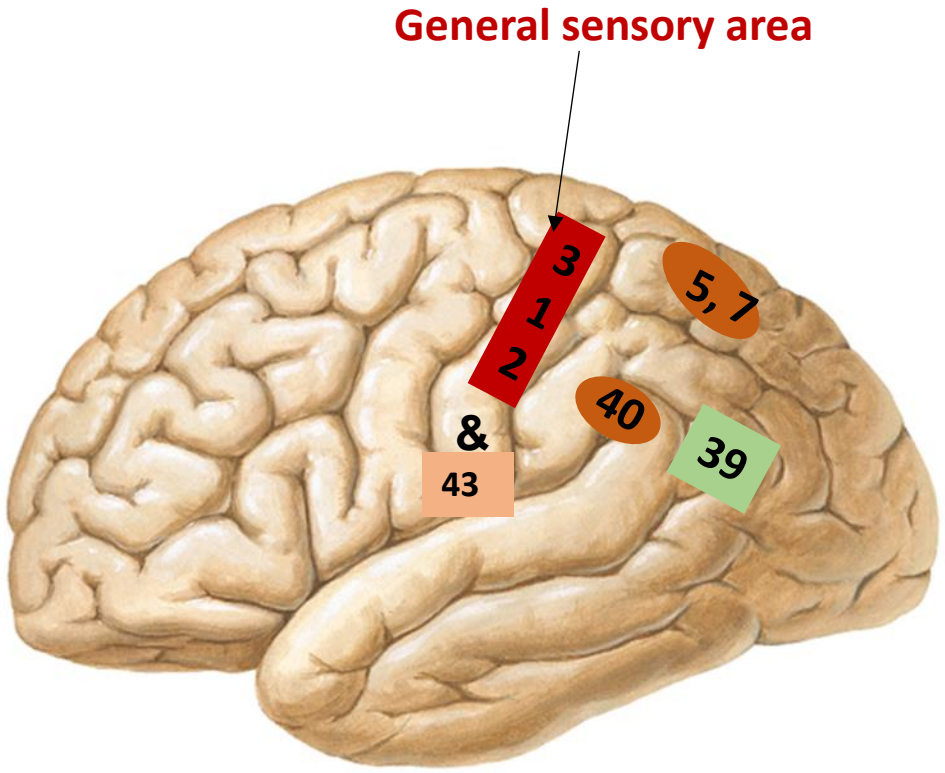
❖ **Primary vestibular area: (&)**

Site: present in the face area of the general sensory area.

❖ **Two sensory speech areas:** in the dominant hemisphere in the following gyri:

a. Angular gyrus (area 39): understands written language.

b. Supramarginal gyrus (area 40): understands sizes, shapes, weights and texture.



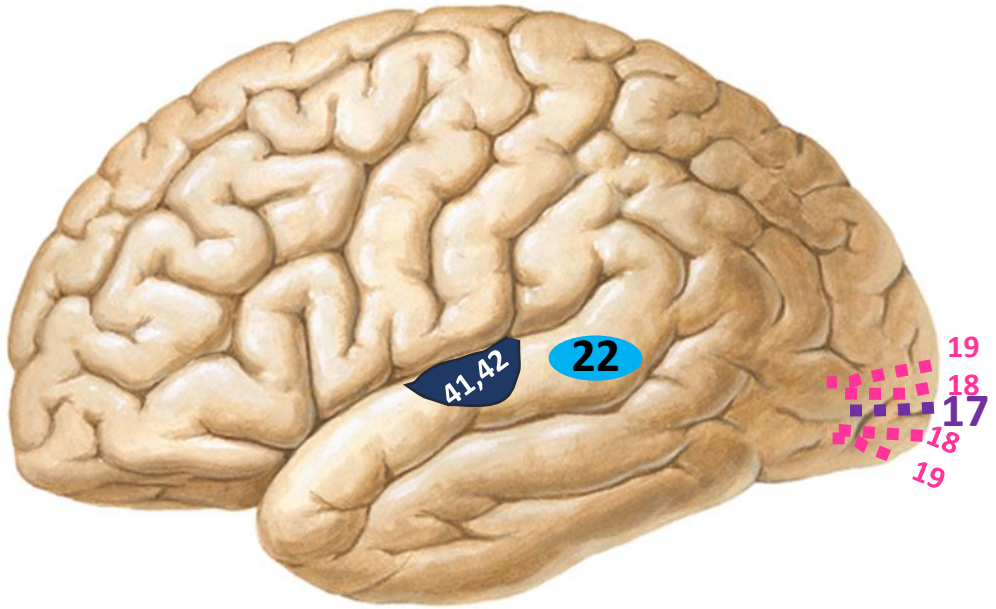
Cerebral Hemisphere

The superolateral surface

- **Cortical areas in Temporal Lobe:**

❖ **Primary auditory area (Heschl's area) (areas 41 & 42):** in the middle of the upper surface of the superior temporal gyrus.

❖ **Auditory association area (Wernicke s area) (area 22):** in the posterior part of the superior temporal gyrus. It is a **sensory speech area**, it recognizes what you hear. It understands spoken language.



- **Cortical areas in Occipital Lobe:**

❖ Extension of the **primary visual area (area 17)** & **visual association areas (# 18 & 19):** around calcarine sulcus.

Cerebral Hemisphere

The Medial surface

Sulci:

1. **Callosal sulcus:** lies above the corpus callosum.
2. **Cingulate sulcus:** extends parallel to the callosal sulcus.
3. **Marginal sulcus:** extends from the cingulate sulcus to lie behind the central sulcus.
4. **Subparietal sulcus:** extends from the cingulate sulcus toward the calcarine sulcus
5. **Calcarine sulcus.**
6. **Parieto-occipital sulcus:** extends from the calcarine sulcus to the superior border.
7. **Collateral sulcus:** is mainly present on the inferior surface.

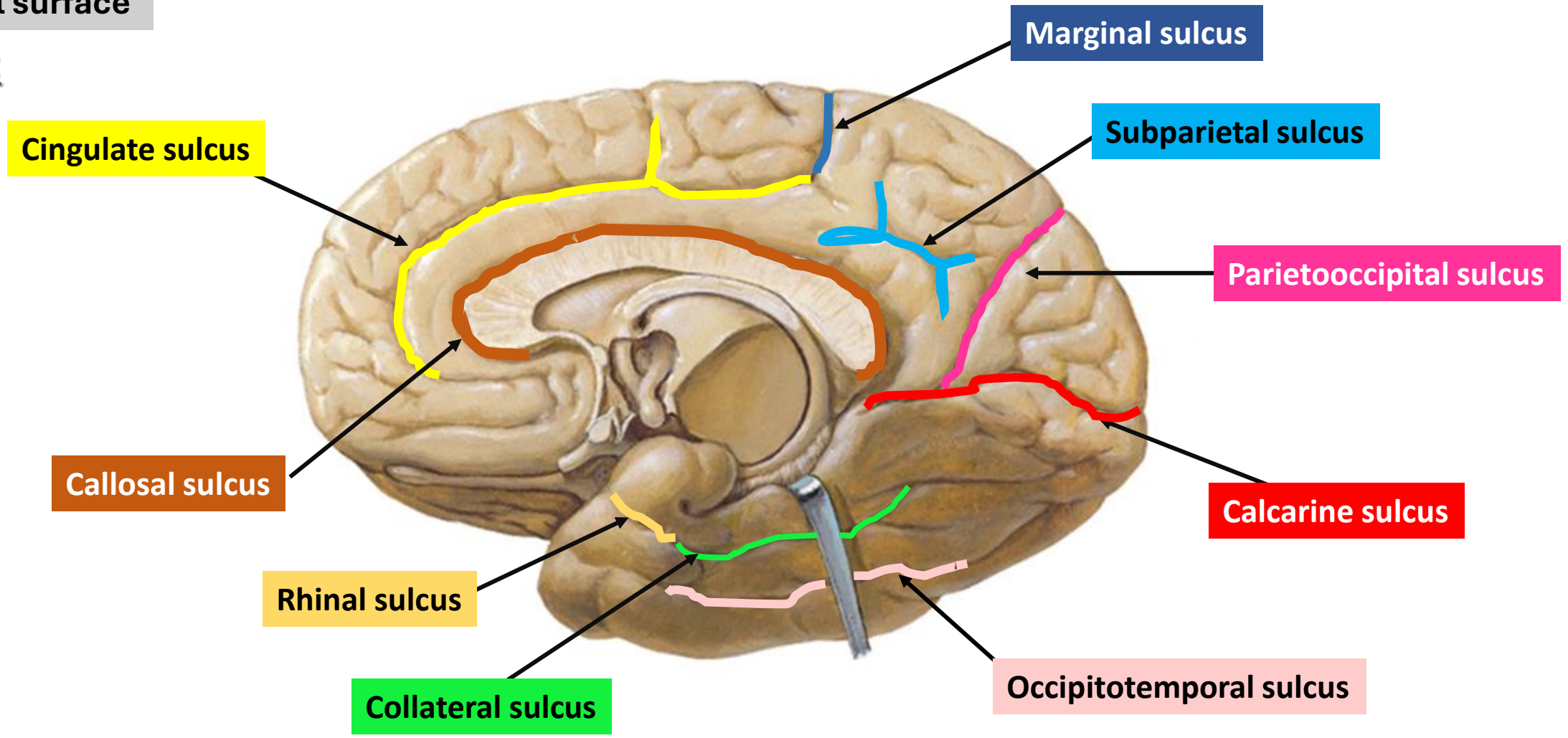
Gyri :

1. **Cingulate gyrus:** lies above the corpus callosum, between the callosal sulcus and cingulate sulcus. It curves around the splenium of corpus callosum to form the **isthmus** and continues anteriorly in the temporal lobe as the **parahippocampal gyrus**.
2. **Lingual gyrus:** lies below the calcarine sulcus.
3. **Cuneus:** lies between the calcarine sulcus, superior border and parieto-occipital sulcus.
4. **Precuneus:** lies between the parieto-occipital sulcus, marginal sulcus, subparietal sulcus
and superior border.
5. **Paracentral lobule:** the area surrounding the upper end of the central sulcus.
6. **Superior (medial) frontal gyrus:** lies between the cingulate sulcus and the upper border.

Cerebral Hemisphere

The Medial surface

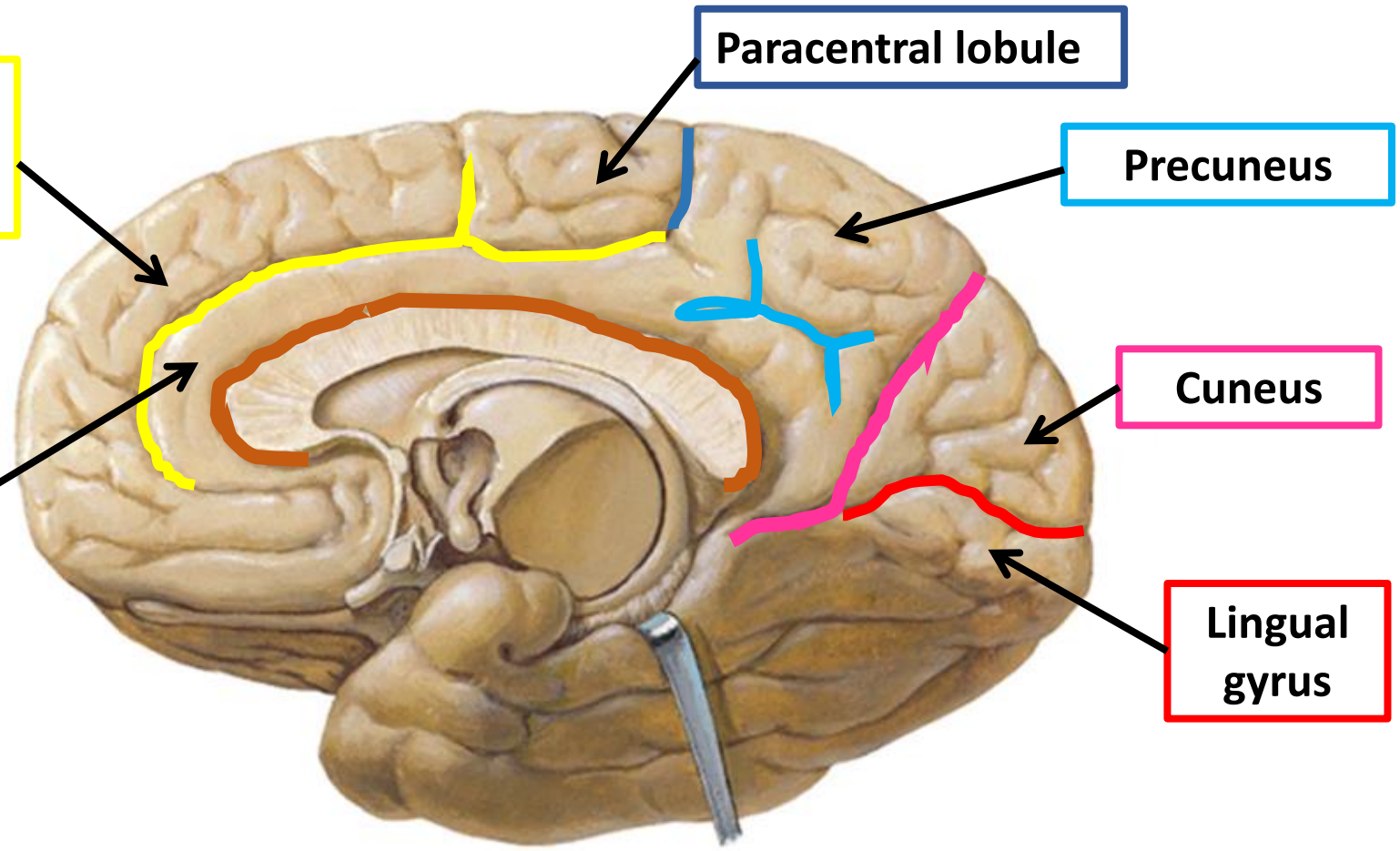
- **Sulci:**



Cerebral Hemisphere

The Medial surface

- **Gyri:**



Cerebral Hemisphere

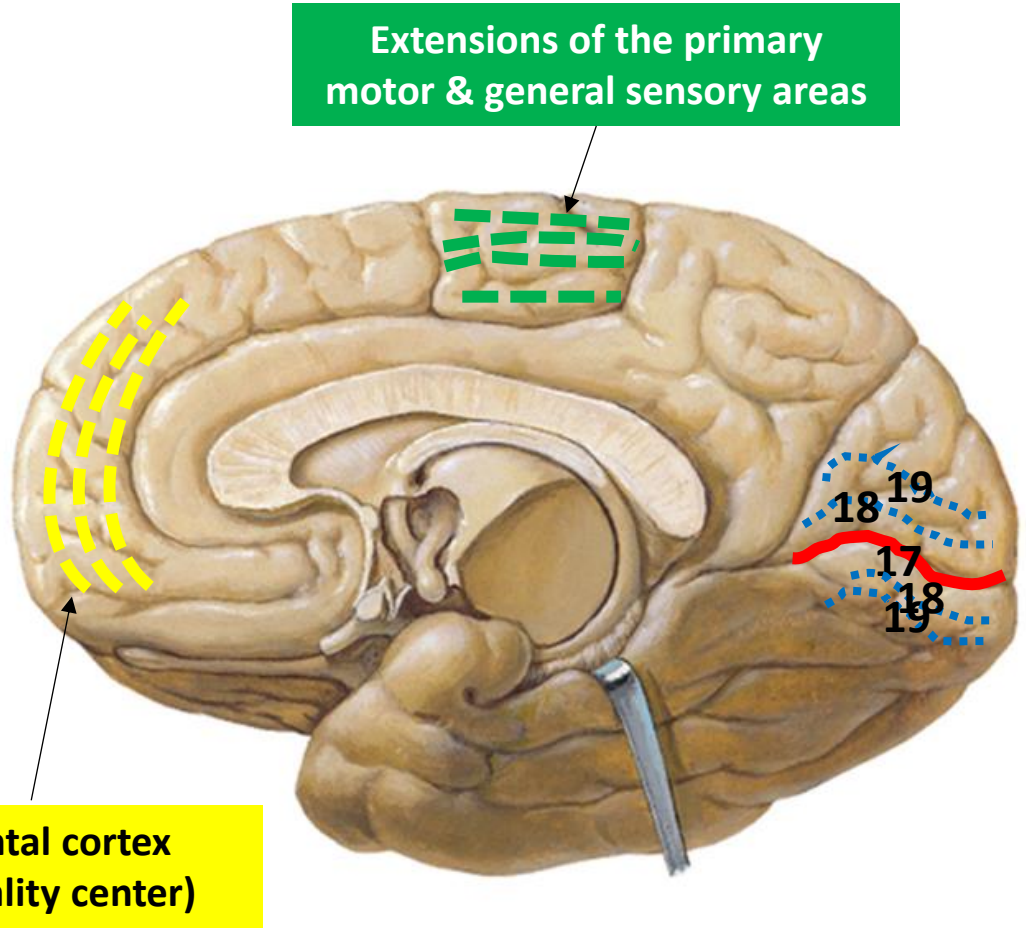
Cortical areas of the medial surface

1. Primary visual area (area 17): present above and below the calcarine sulcus.

2. Visual association areas (areas 18 & 19): on either side of the primary visual area.

3. Extension of the primary motor & general sensory areas: in the **paracentral lobule**.

4. Prefrontal cortex (personality center): in the frontal pole.



Cerebral Hemisphere

The Inferior surface

Orbital surface:

Sulci:

- ✓ Olfactory sulcus.
- ✓ Orbital sulcus (H-shaped sulcus).

Gyri:

- ✓ Gyrus rectus: medial to the olfactory sulcus.
- ✓ Orbital gyri.

Tentorial surface:

Sulci:

- ✓ Collateral sulcus.
- ✓ Rhinal sulcus.
- ✓ Occipitotemporal sulcus.

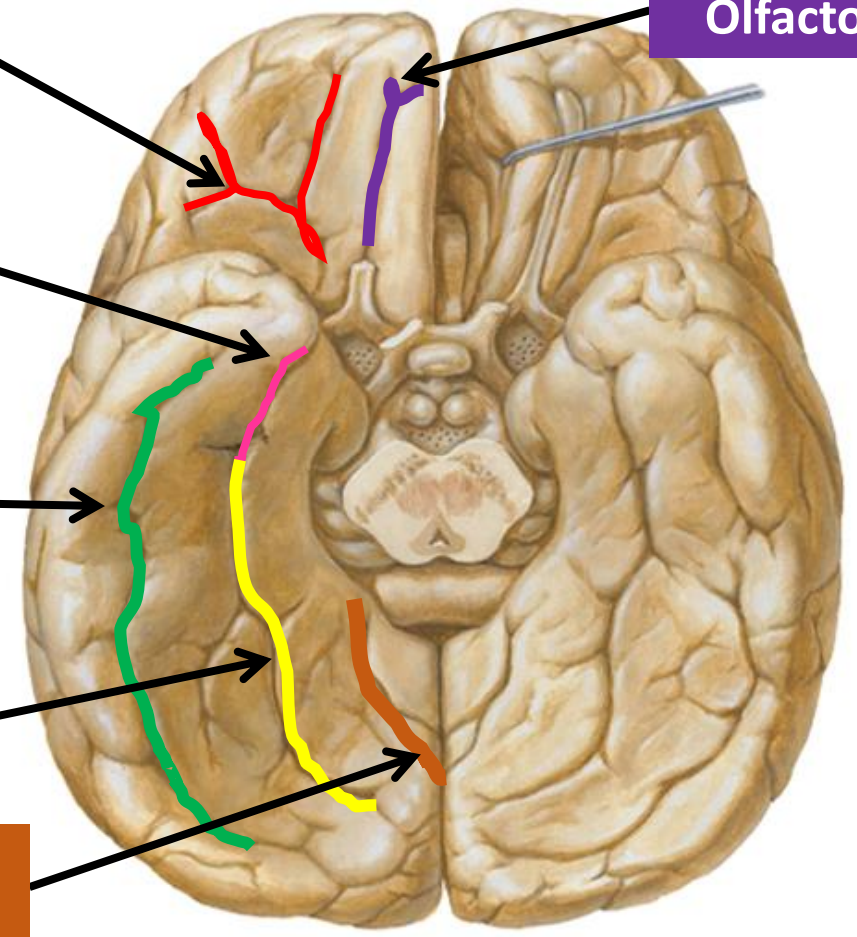
Gyri:

- ✓ Parahippocampal gyrus.
- ✓ Uncus (the anterior end of the parahippocampal gyrus).
- ✓ Occipitotemporal gyrus (fusiform gyrus): Between collateral & occipitotemporal sulci.

Cerebral Hemisphere

The Inferior surface

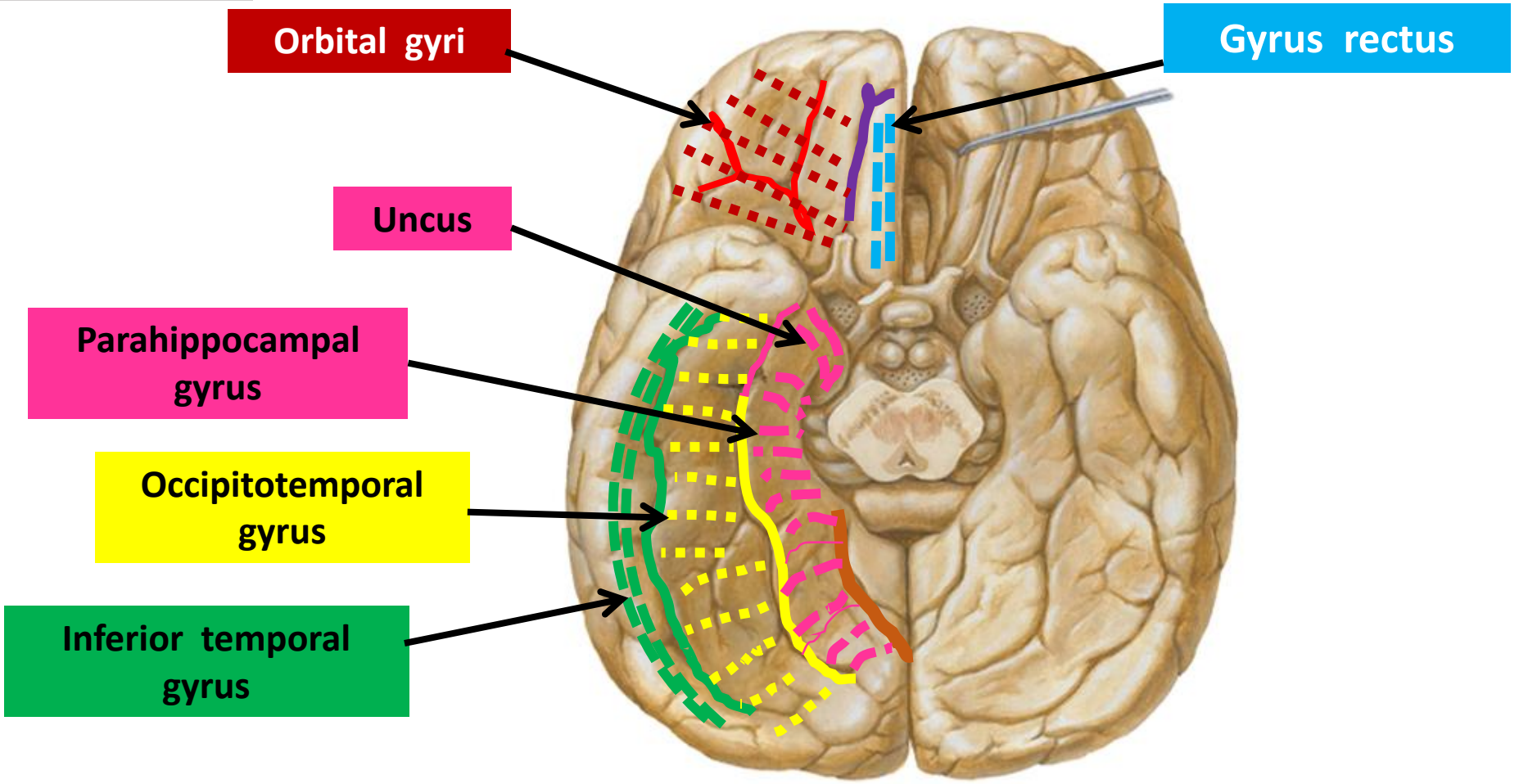
- **Sulci:**



Cerebral Hemisphere

The Inferior surface

- **Gyri:**

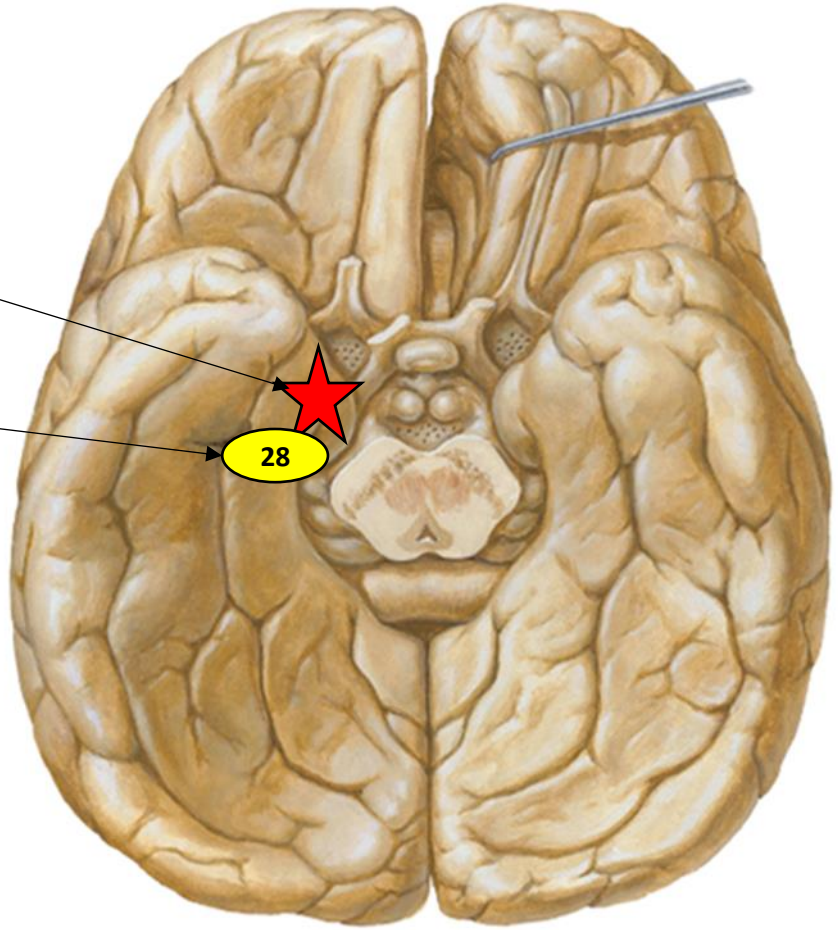


Cerebral Hemisphere

Cortical areas of the inferior surface

1. Primary olfactory area: located in the uncus.

2. Olfactory association area (area 28)**:** in the anterior part of the parahippocampal gyrus.




Thank
you!