WITH NOTES

External features of cerebral hemispheres

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Cerebral Hemisphere

3 Poles

4 Major Sulci

3 surfaces

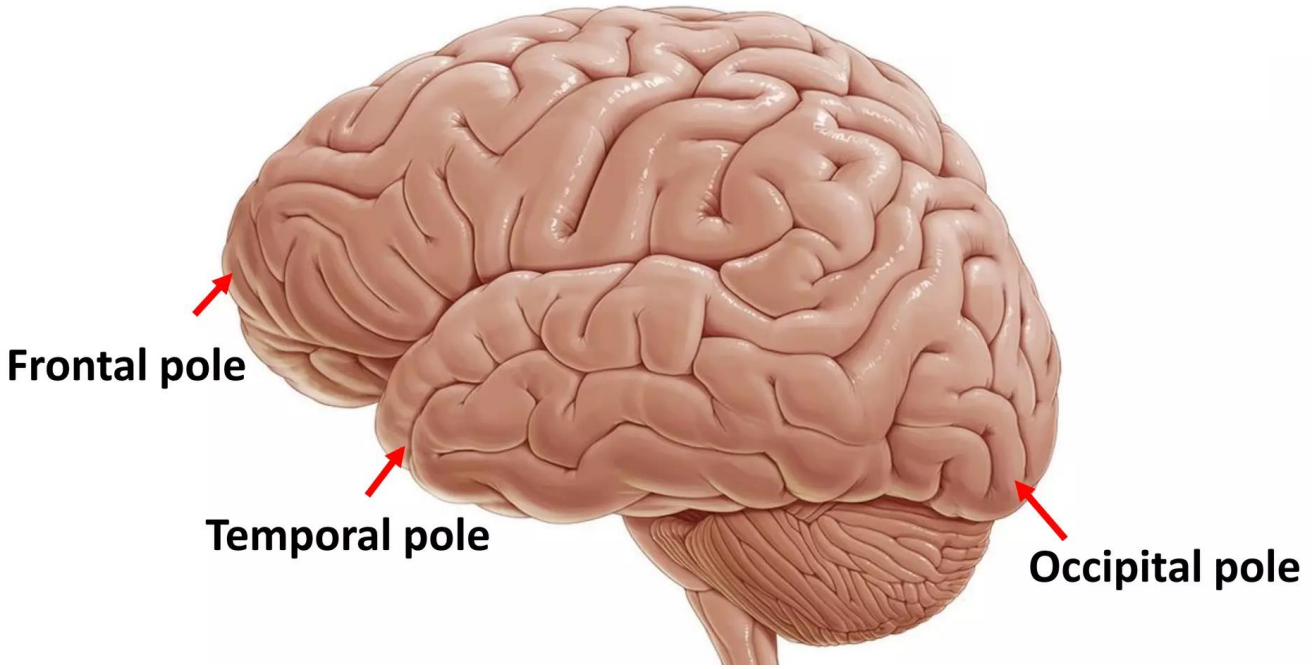
Each cerebral hemisphere has:

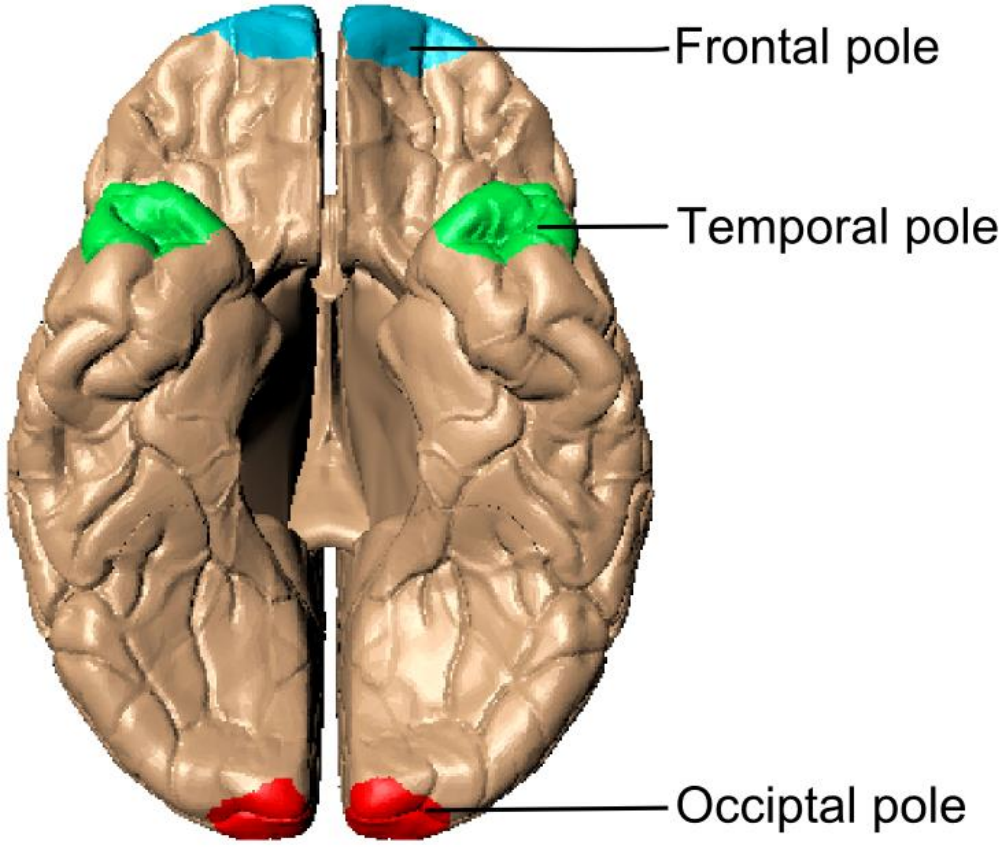
3 Borders

4 Lobes

Cerebral Hemisphere

3 Poles:





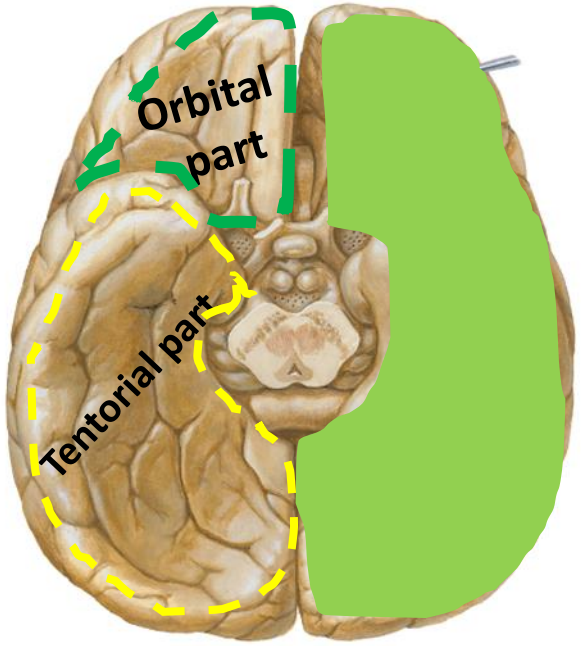
OSPE مهم : Identify ?

Cerebral Hemisphere

3 Surfaces:

Lateral (superolateral) surface

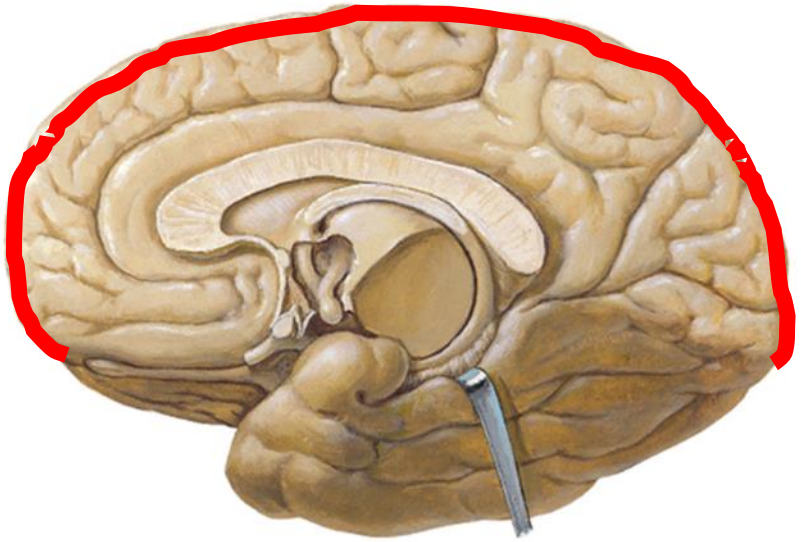
Medial surface



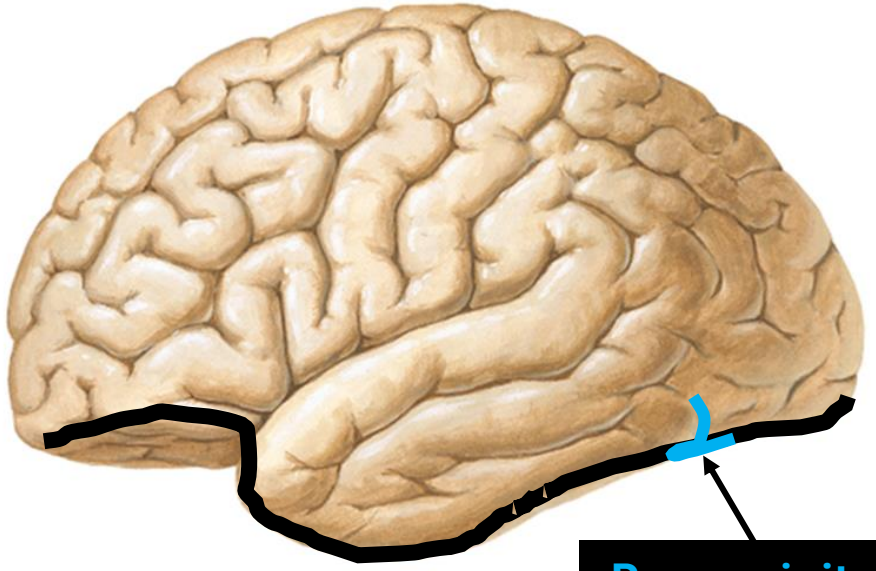
Inferior surface:

Cerebral Hemisphere

3 Borders:



Superior border



Inferolateral border

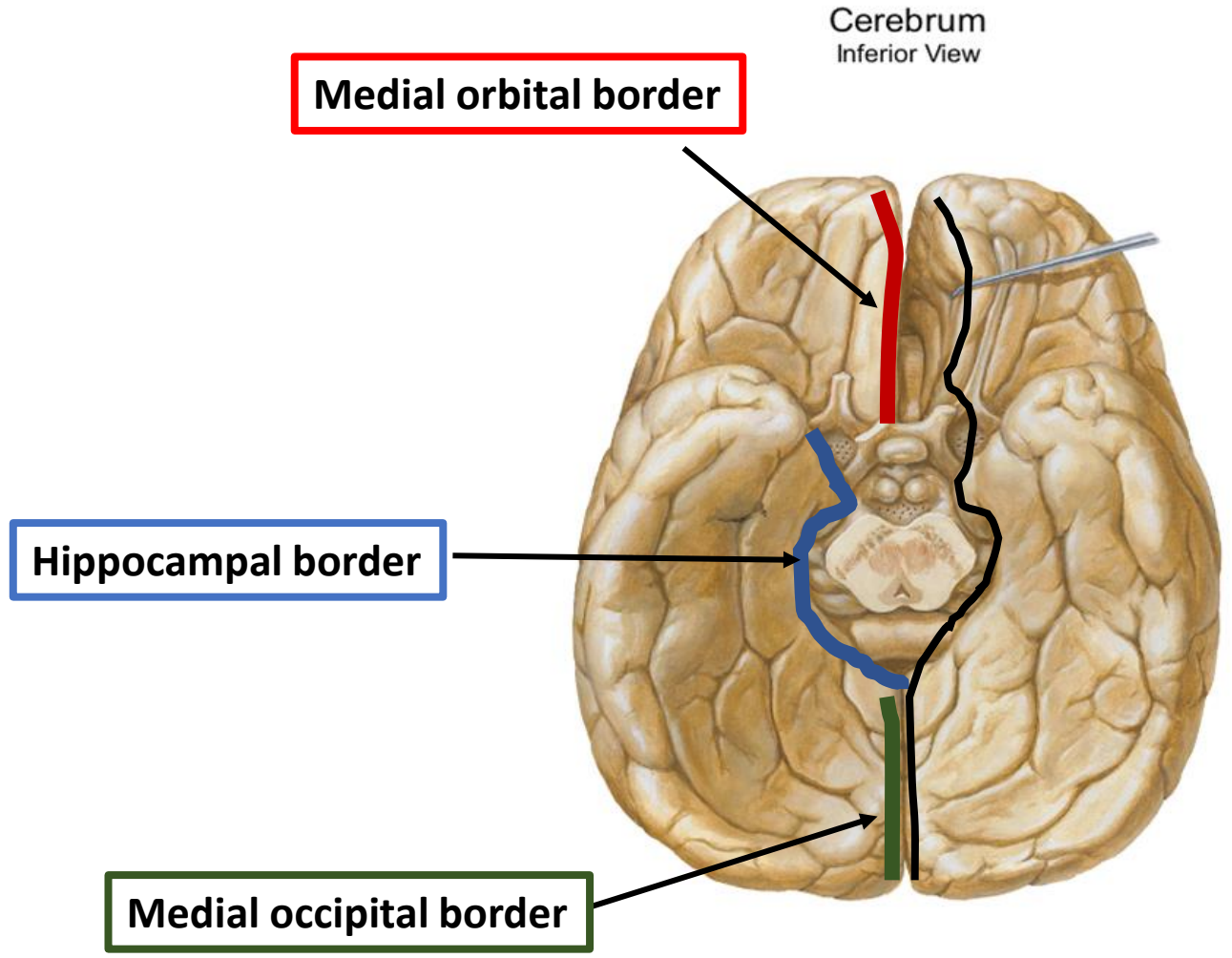
Cerebral Hemisphere

3 Borders:

Inferomedial border

في ال Inferomedial border
قالت ممكن تشاور عليه
و تقول اكتب تقسيماته

Medial orbital border
Hippocampal border
Medial occipital border



Cerebral Hemisphere

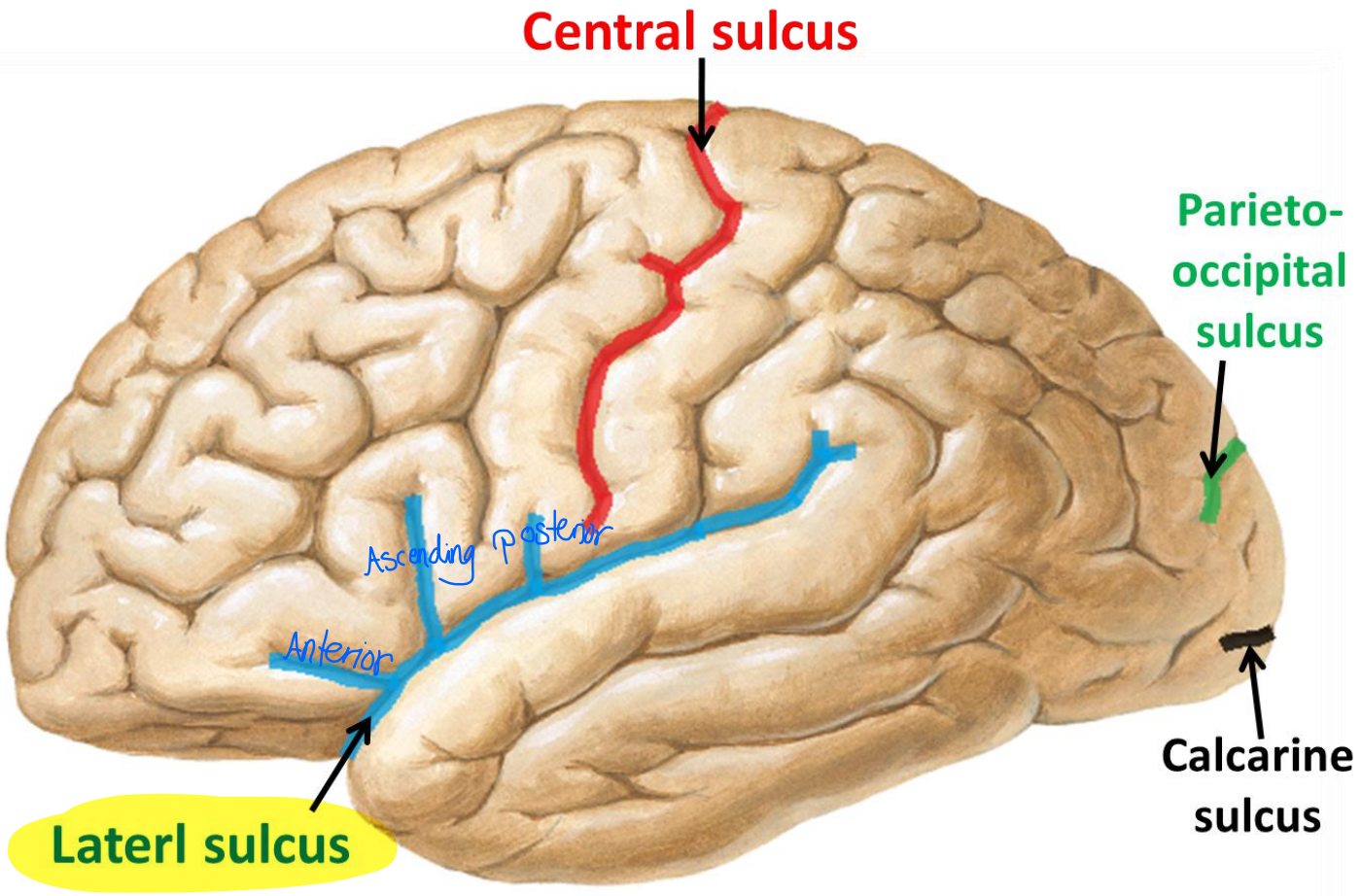
4 major sulci:

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



OSPE : Enumerate 4 major sulci ?

Cerebral Hemisphere

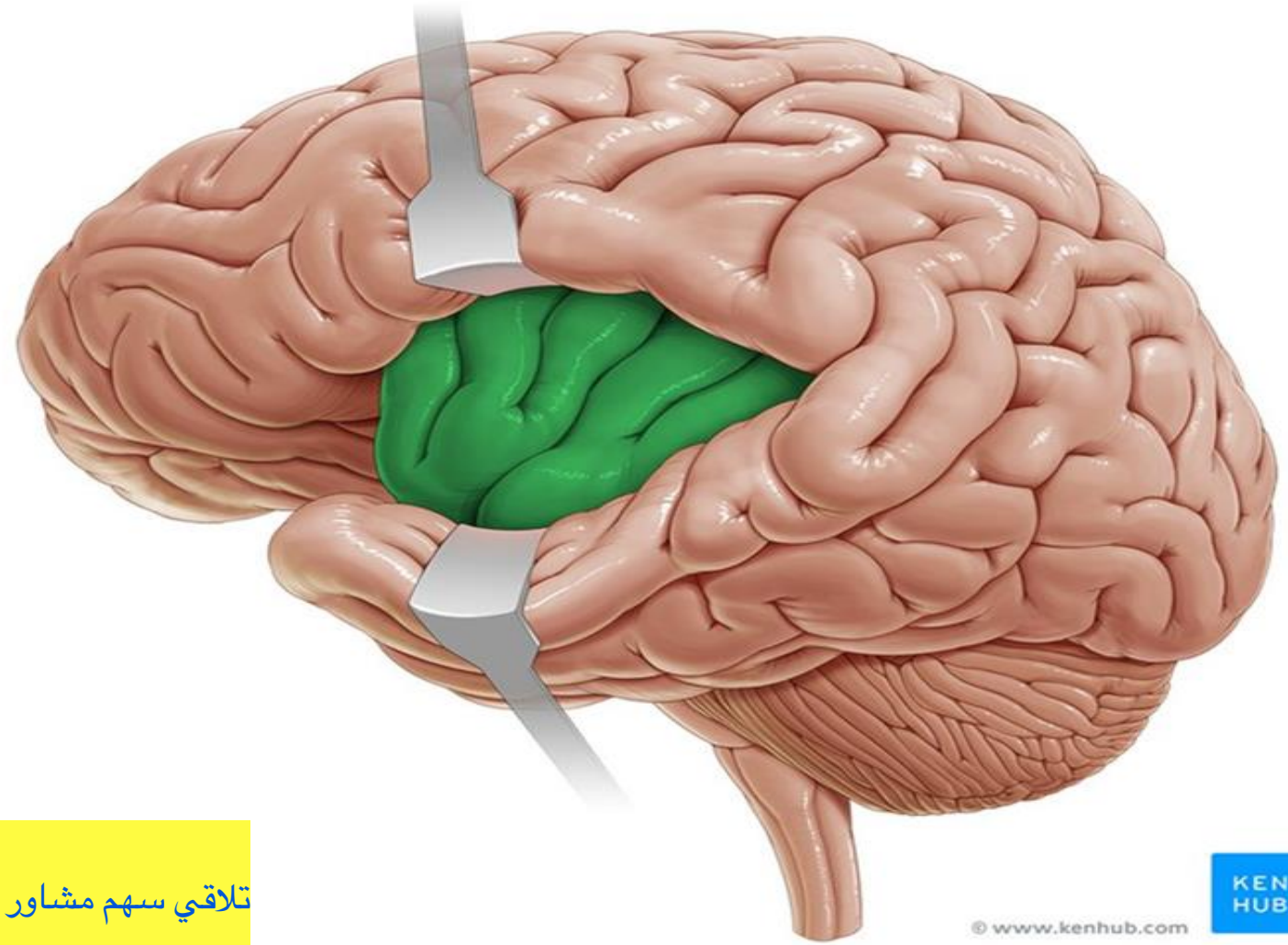
4 major sulci:

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**



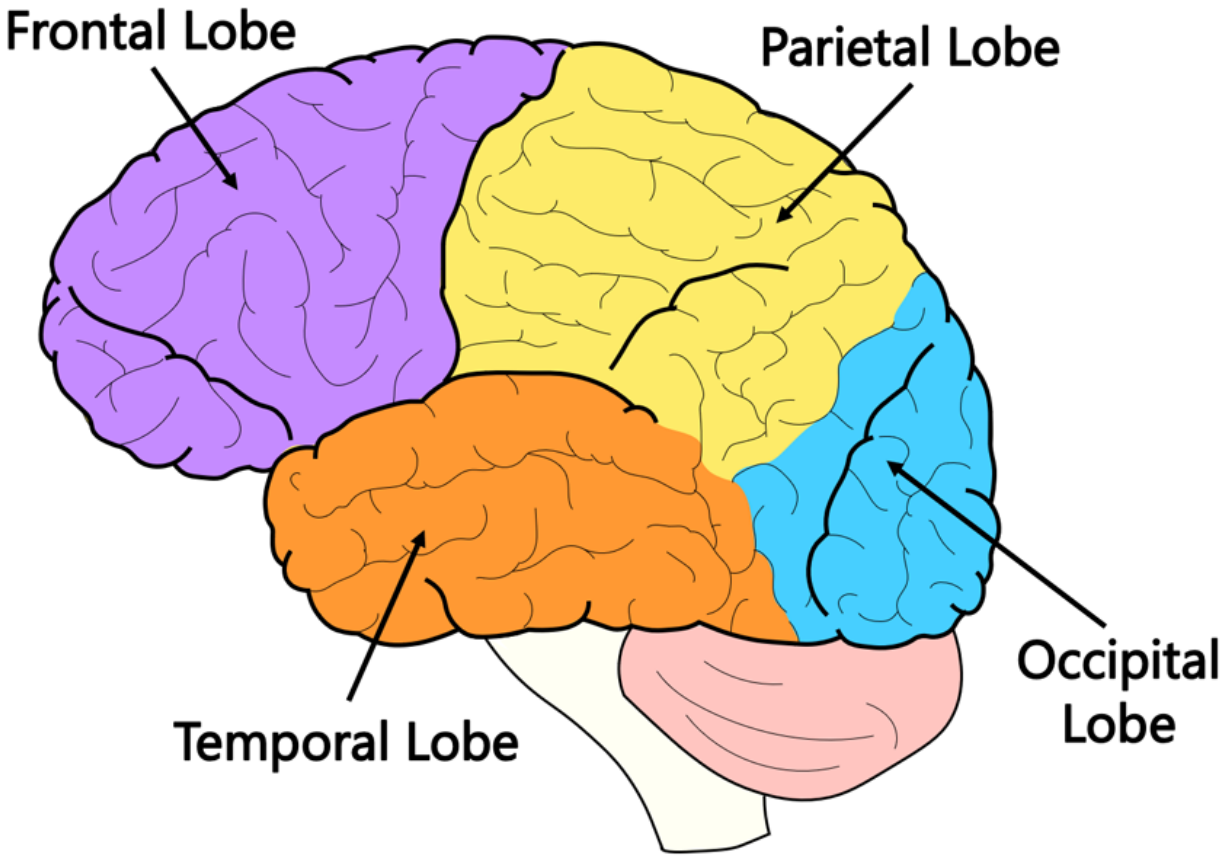
OSPE :

تلاقي سهم مشاور على الlateral sulcus ويسألك :

1- Identify - Mention the name of these sulcus ?
2- Mention the part in cortex present in site ? Insula

Cerebral Hemisphere

4 Lobes:



Cerebral Hemisphere

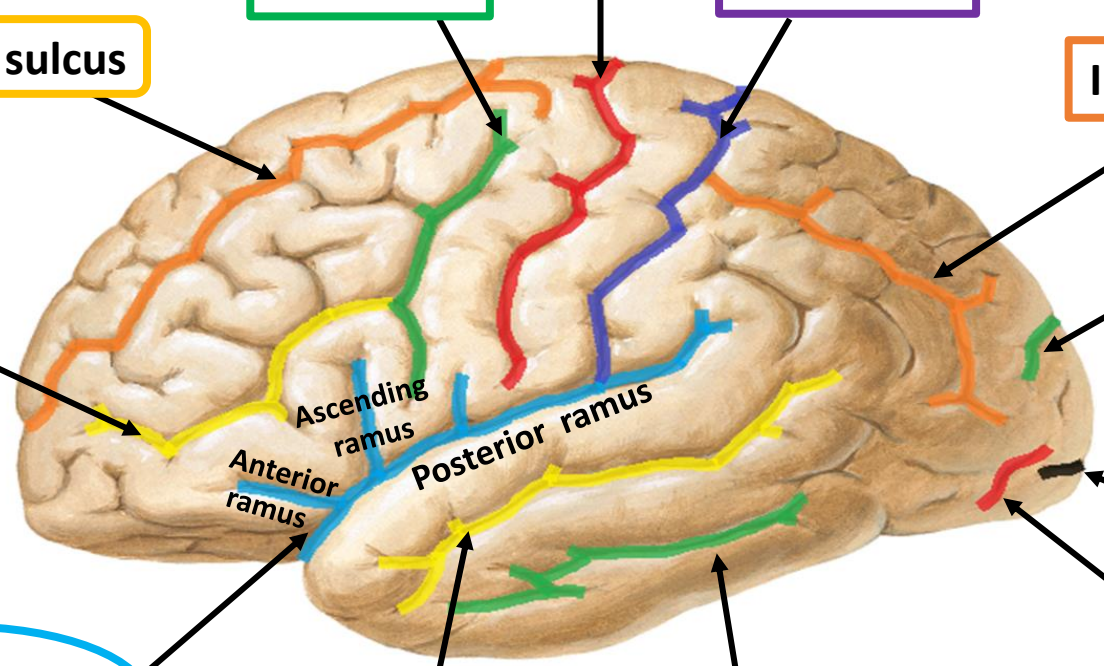
The superolateral surface

- **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:**



OSPE : Identify the name of these sulcus ?

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.

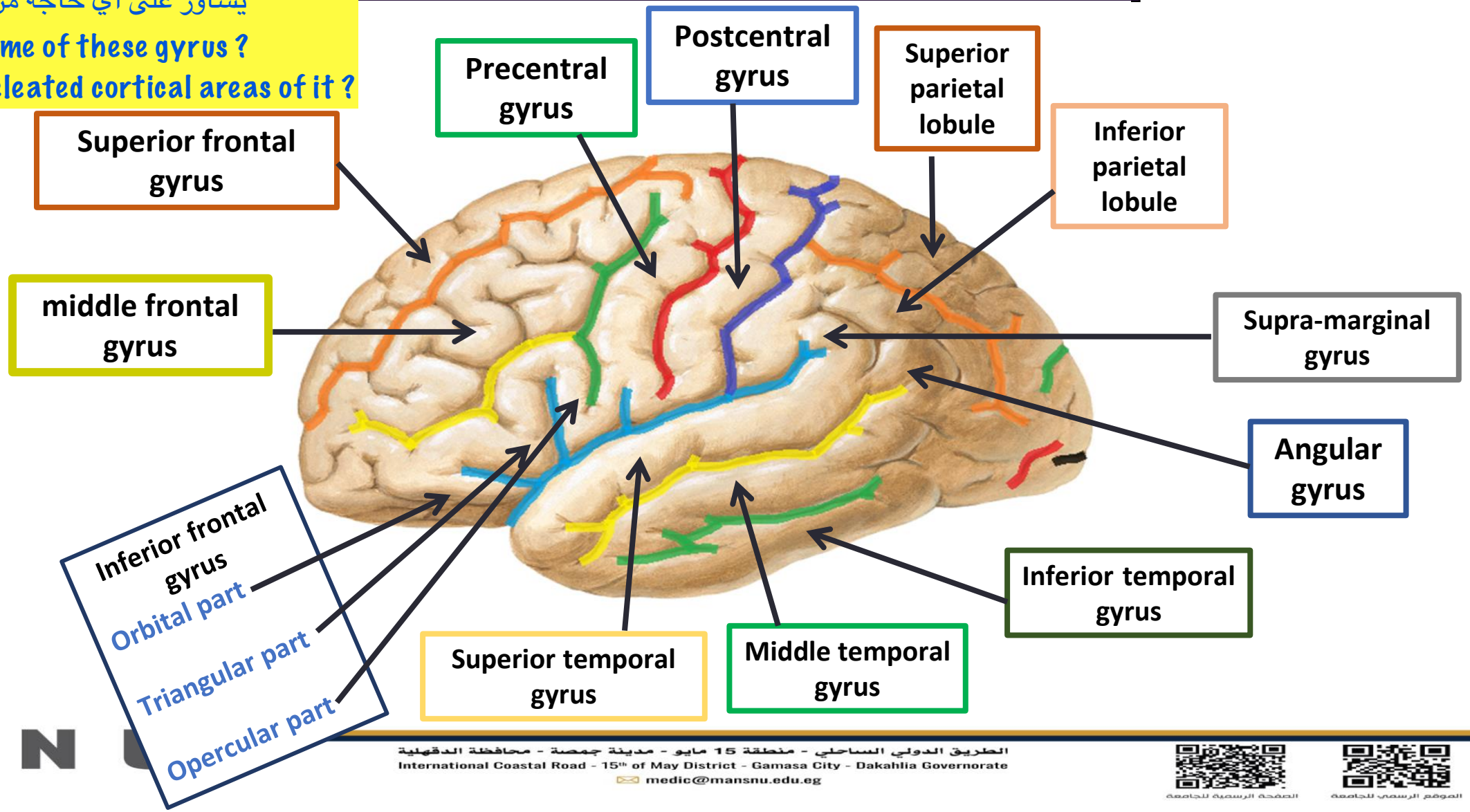
6. Inferior parietal lobule: below the intraparietal sulcus. It is divided into:

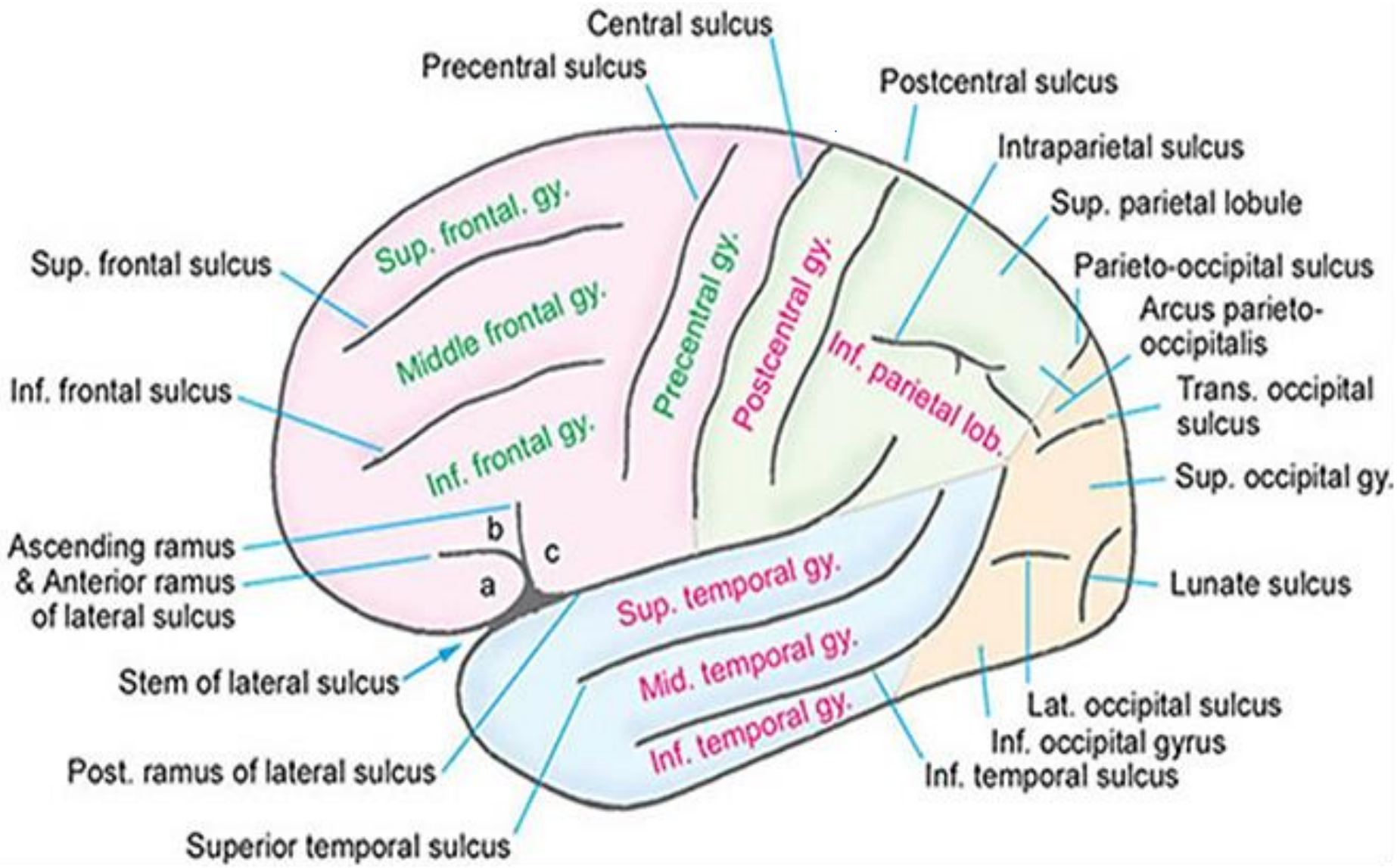
a. Supramarginal gyrus: surrounds the posterior end of the lateral sulcus.

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

Cerebral Hemisphere

OSPE : يشاور على أي حاجة من دول ويسألك
1- Identify the name of these gyrus ?
2- Mention the releated cortical areas of it ?




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. gy.
Middle frontal gy.
Inf. frontal gy.
Precentral gy.
Postcentral gy.
Inf. parietal lob.
Sup. temporal gy.
Mid. temporal gy.
Inf. temporal gy.
Sup. frontal sulcus
Inf. frontal sulcus
Ascending ramus & Anterior ramus of lateral sulcus
b
c
a
Stem of lateral sulcus
Post. ramus of lateral sulcus
Superior temporal sulcus

Cerebral Hemisphere

الدكتورة أكدت ان اسم الarea أهم من الرقم فاحفظوا الاسم كويس

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):**

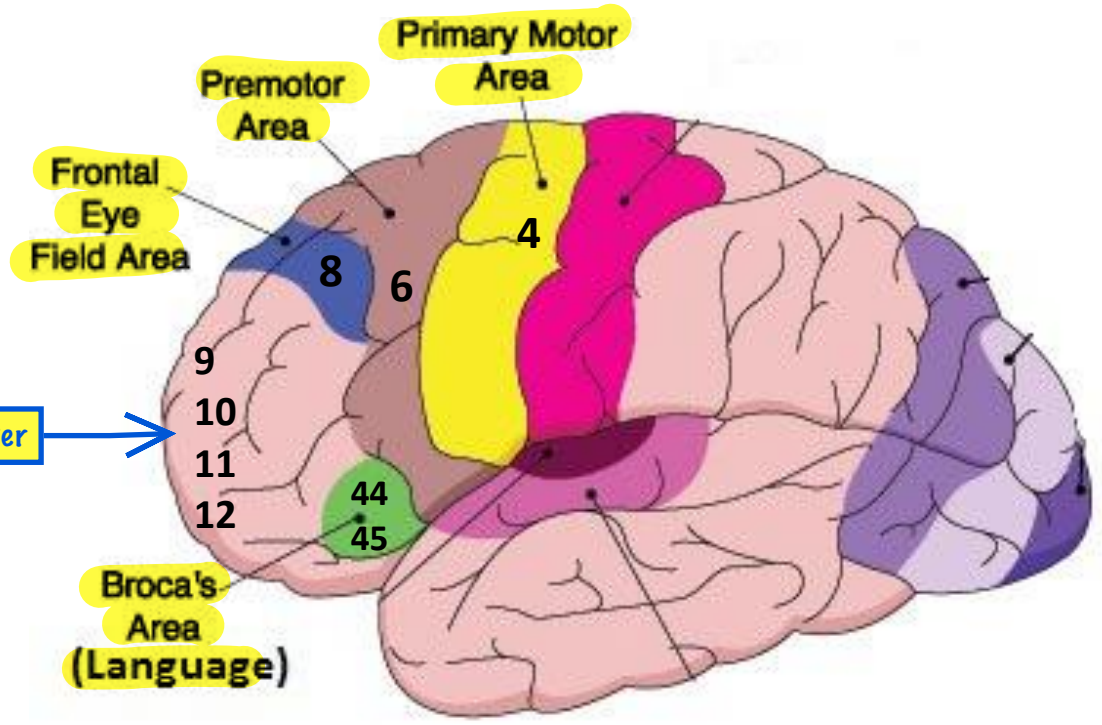
Site: Middle frontal gyrus.

❖ **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.



OSPE : يشاور على أي حاجة من دول ويسألك

- Mention the releated cortical areas of it ?

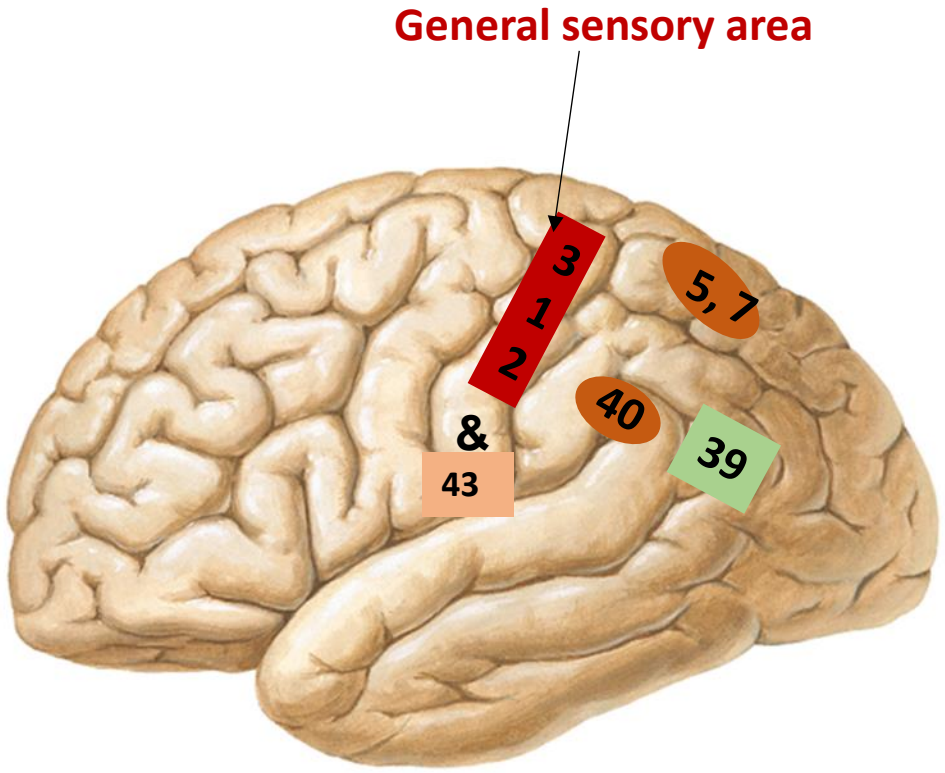
N.B : Area 12 of personality center seen in medial surface

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.



OSPE : Area 5, 7 - Area 39, 40 - Area 3, 1, 2
1- Identify the name of these gyrus ?
2- Mention the releated cortical areas of it ?

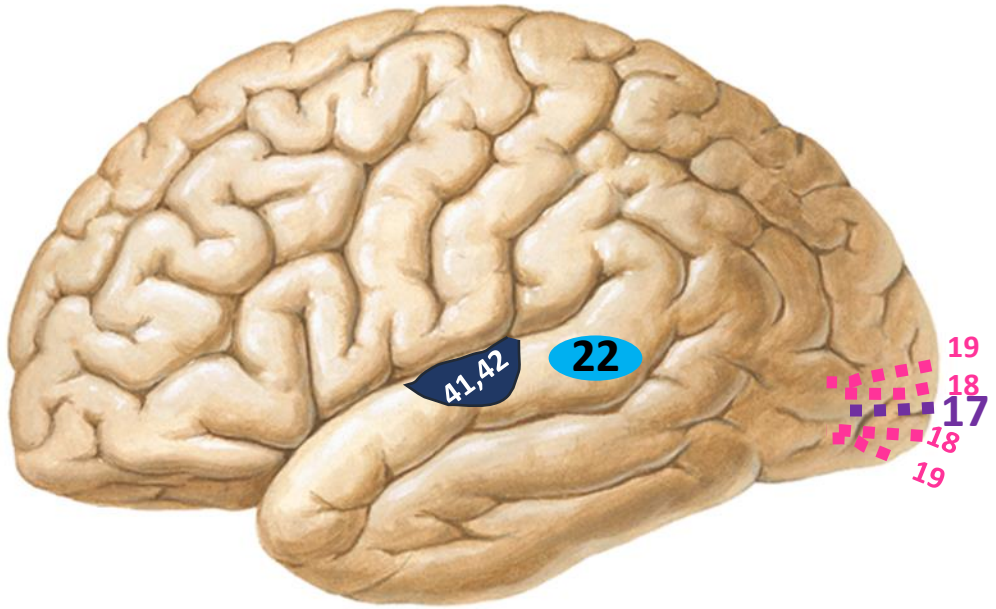
Cerebral Hemisphere

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.

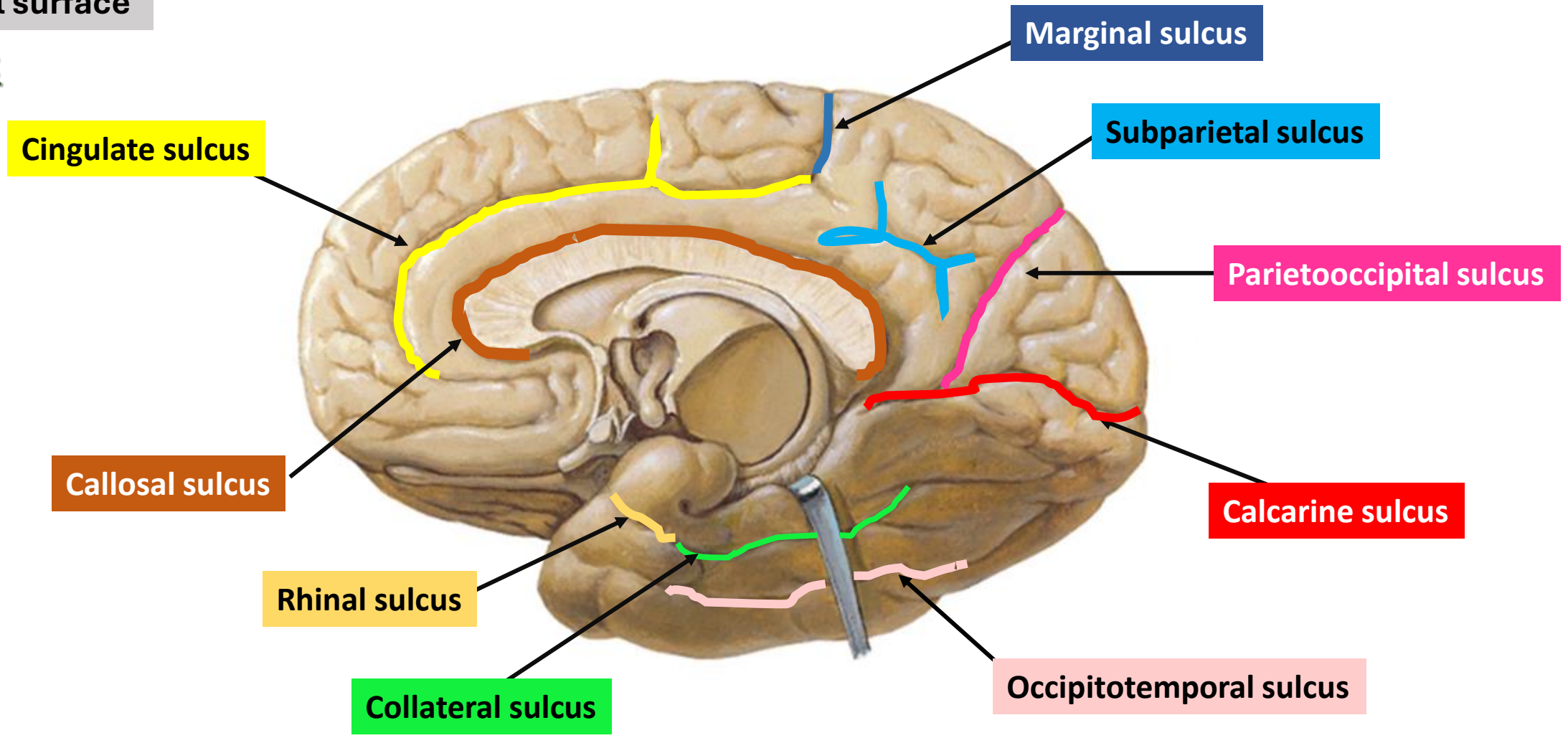
Gyri :

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

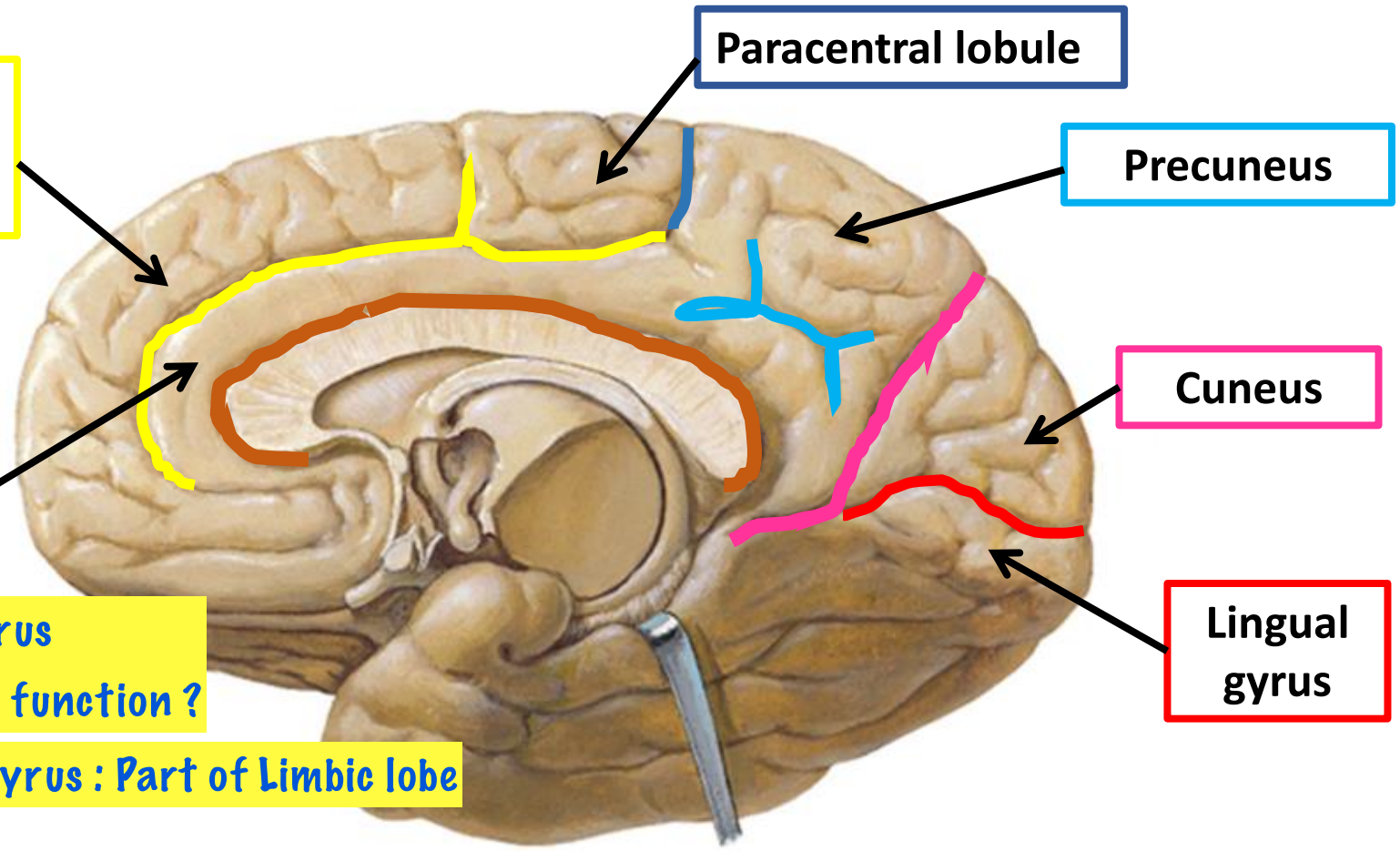
- **Sulci:**



Cerebral Hemisphere

The Medial surface

- **Gyri:**



OSPE مهم : cingulate gyrus

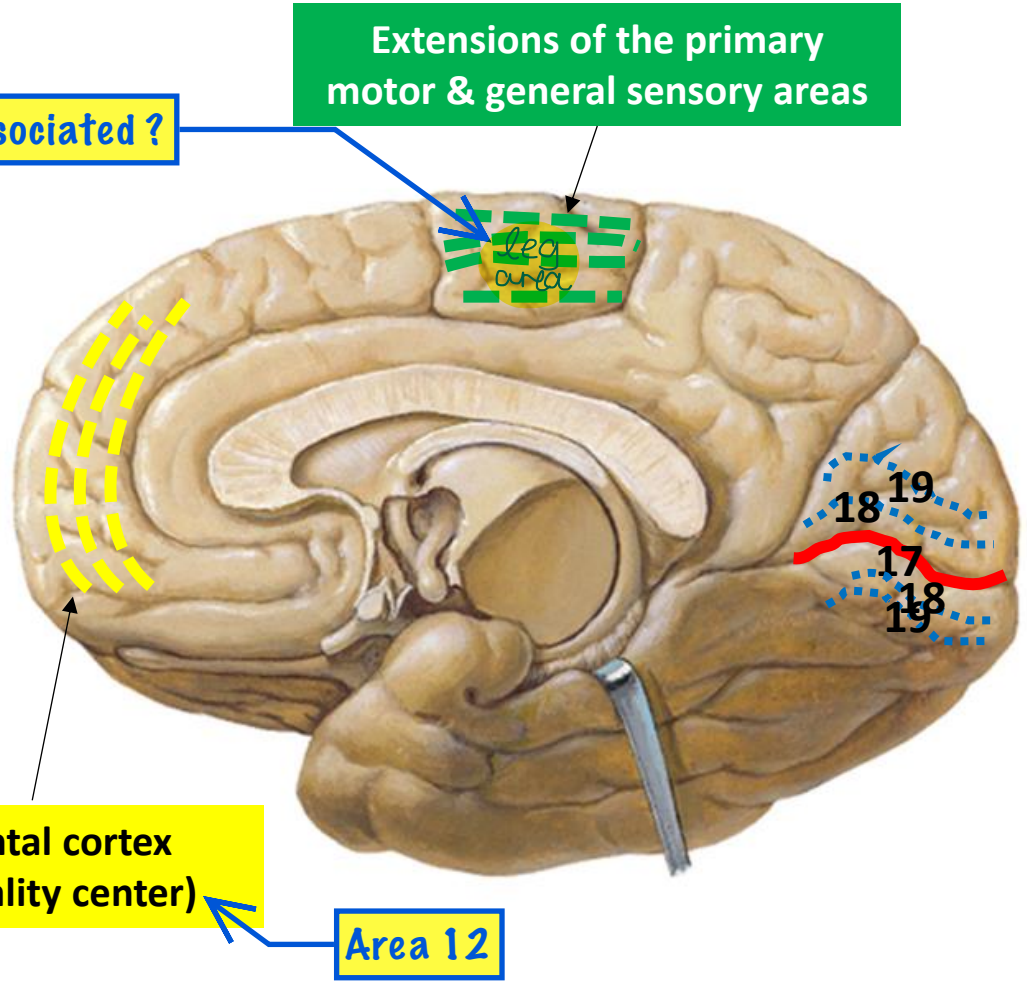
Identify & mention it's function ?

Function of Cingulate gyrus : Part of Limbic lobe

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.

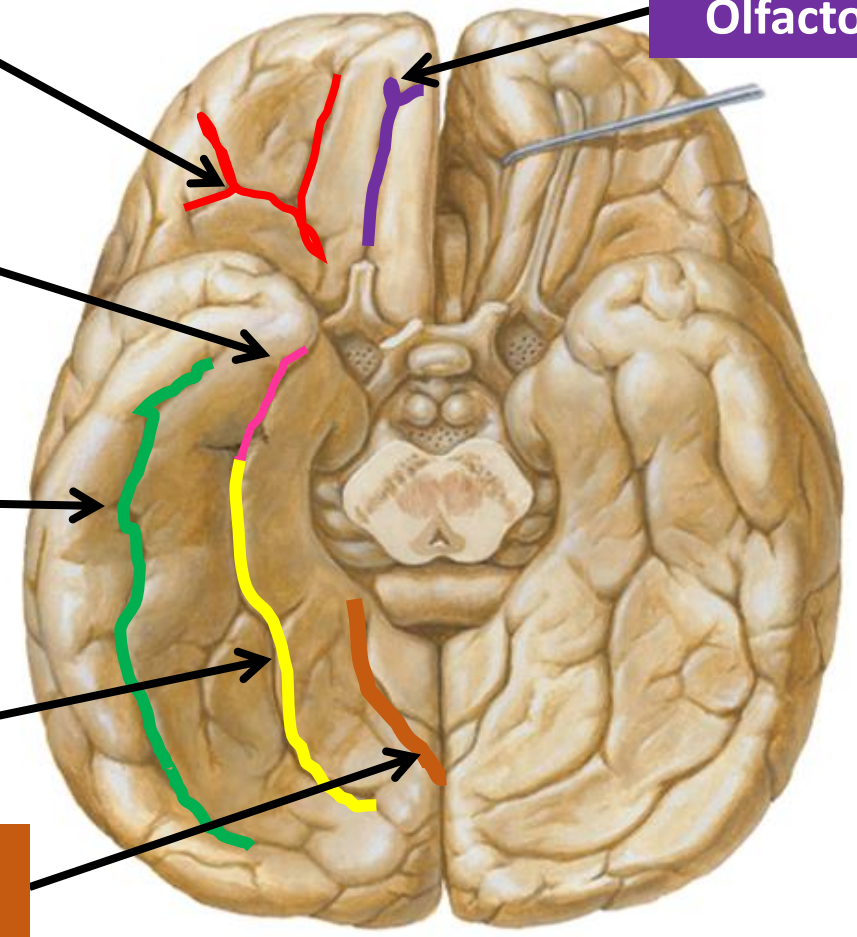
Gyri:

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

Cerebral Hemisphere

The Inferior surface

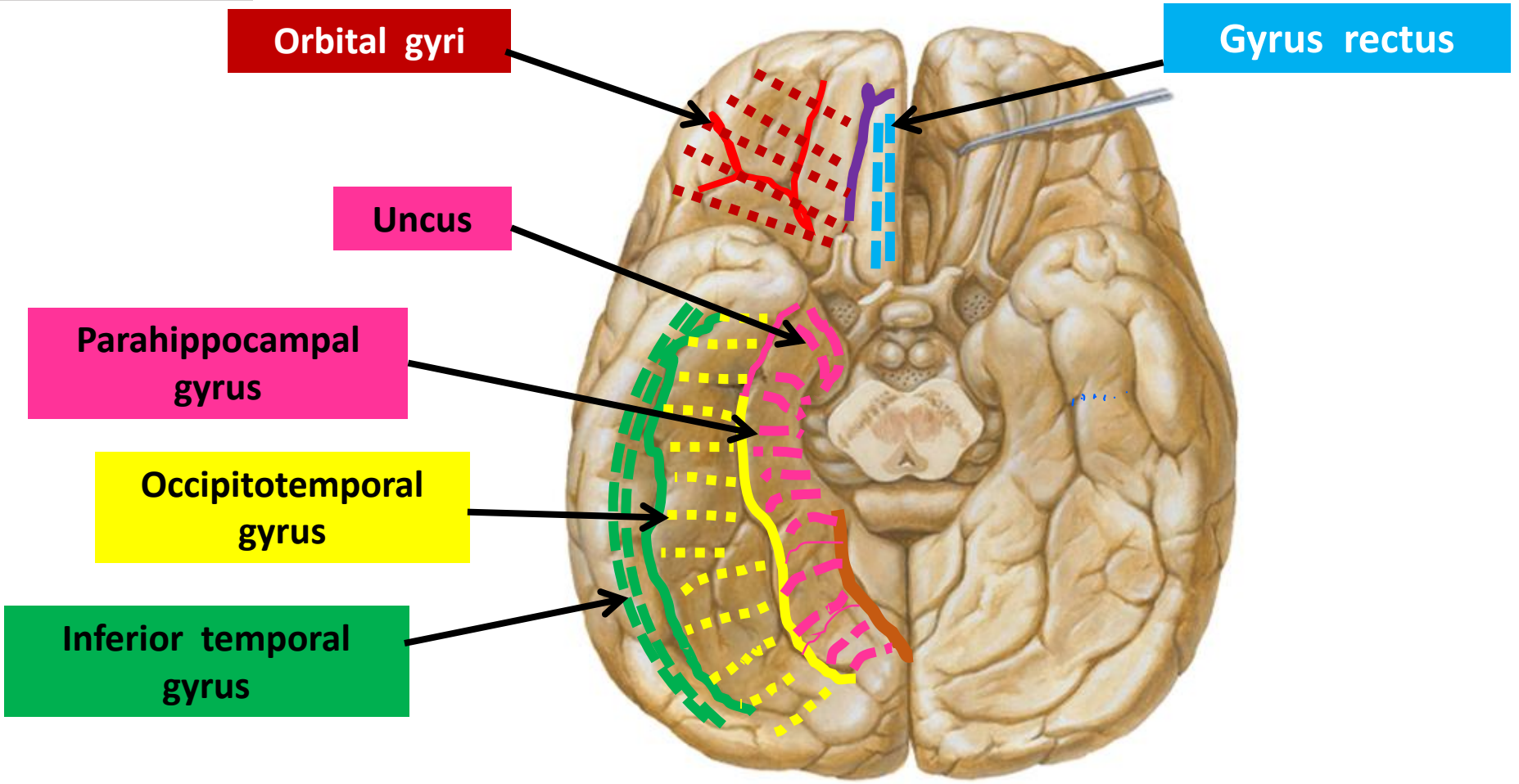
- **Sulci:**



Cerebral Hemisphere

The Inferior surface

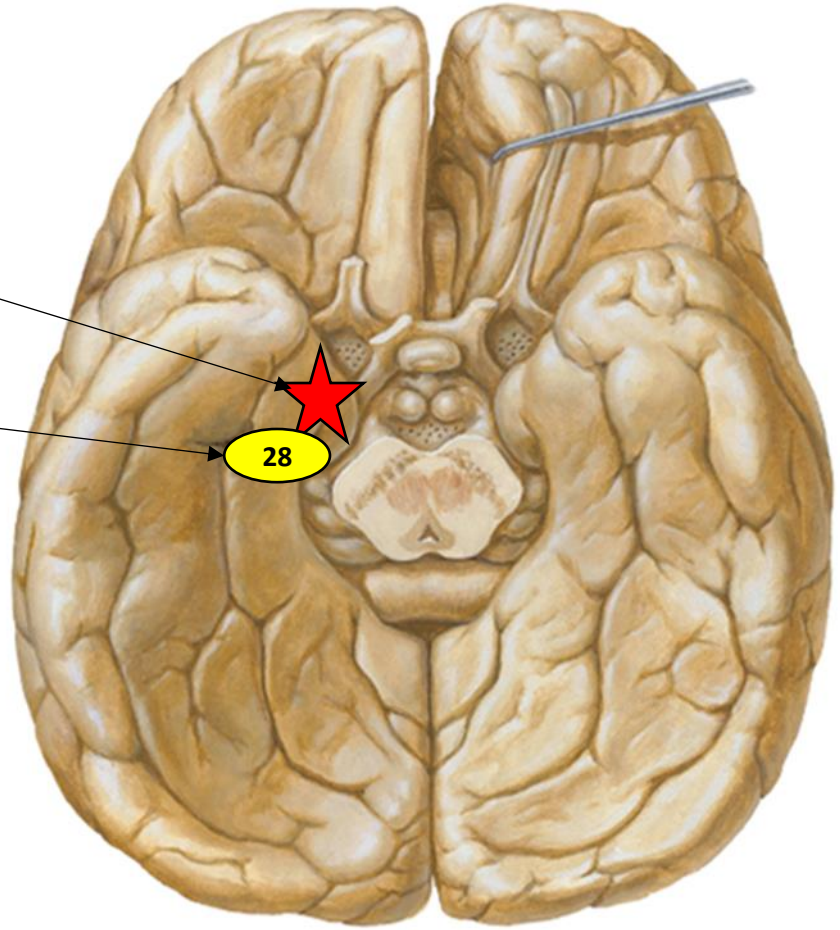
- **Gyri:**



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.



OSPE مهم : Mention the releated cortical areas of it ?

WITH NOTES

External features of brainstem

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OSPE :

- Any feature of brain stem (identify)
- Interpedunclear fossa contents مهمة
- Cerebellopontine angle contents مهمة

brain

1) cerebrum

A) 2 cerebral hemispheres

B) diencephalon

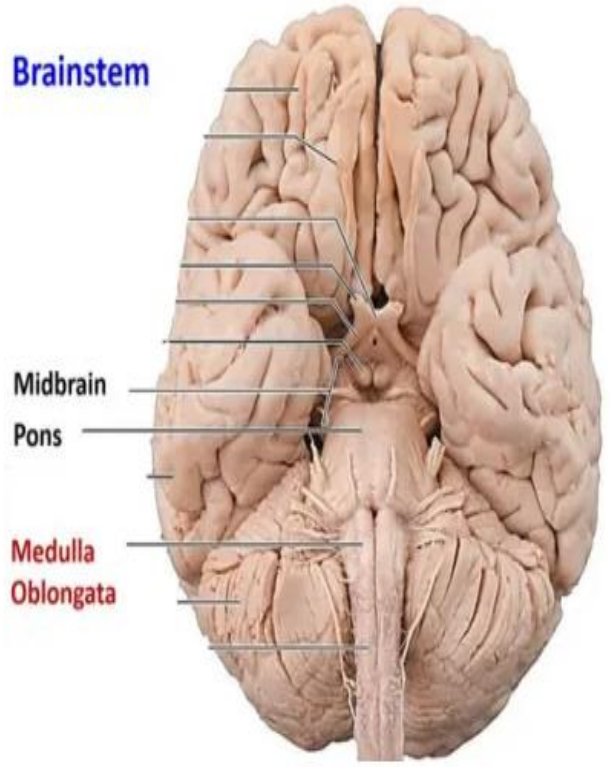
2) Brain stem

A) Mid brain

B) pons

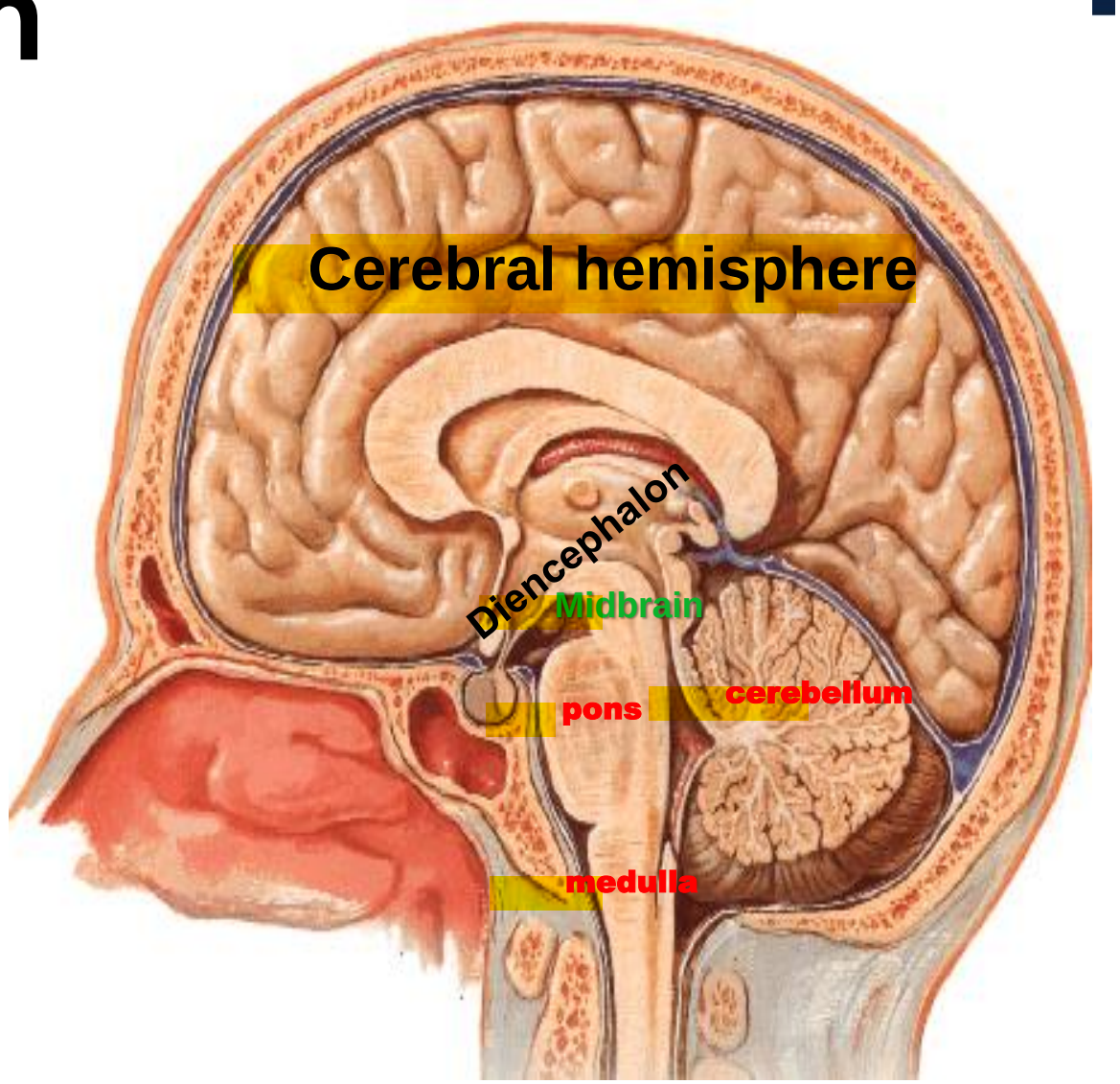
C) Medulla

3) cerebellum

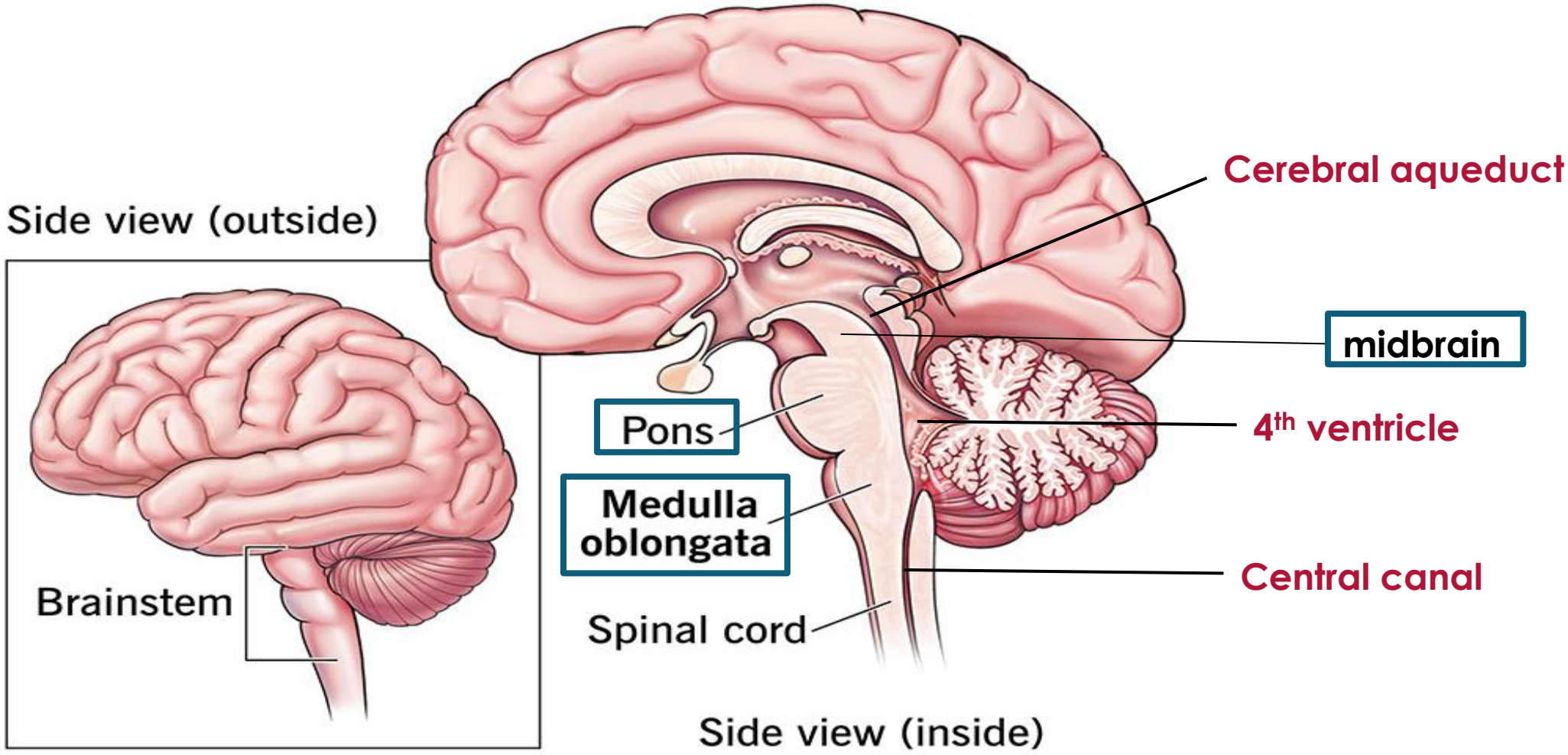


inferior view

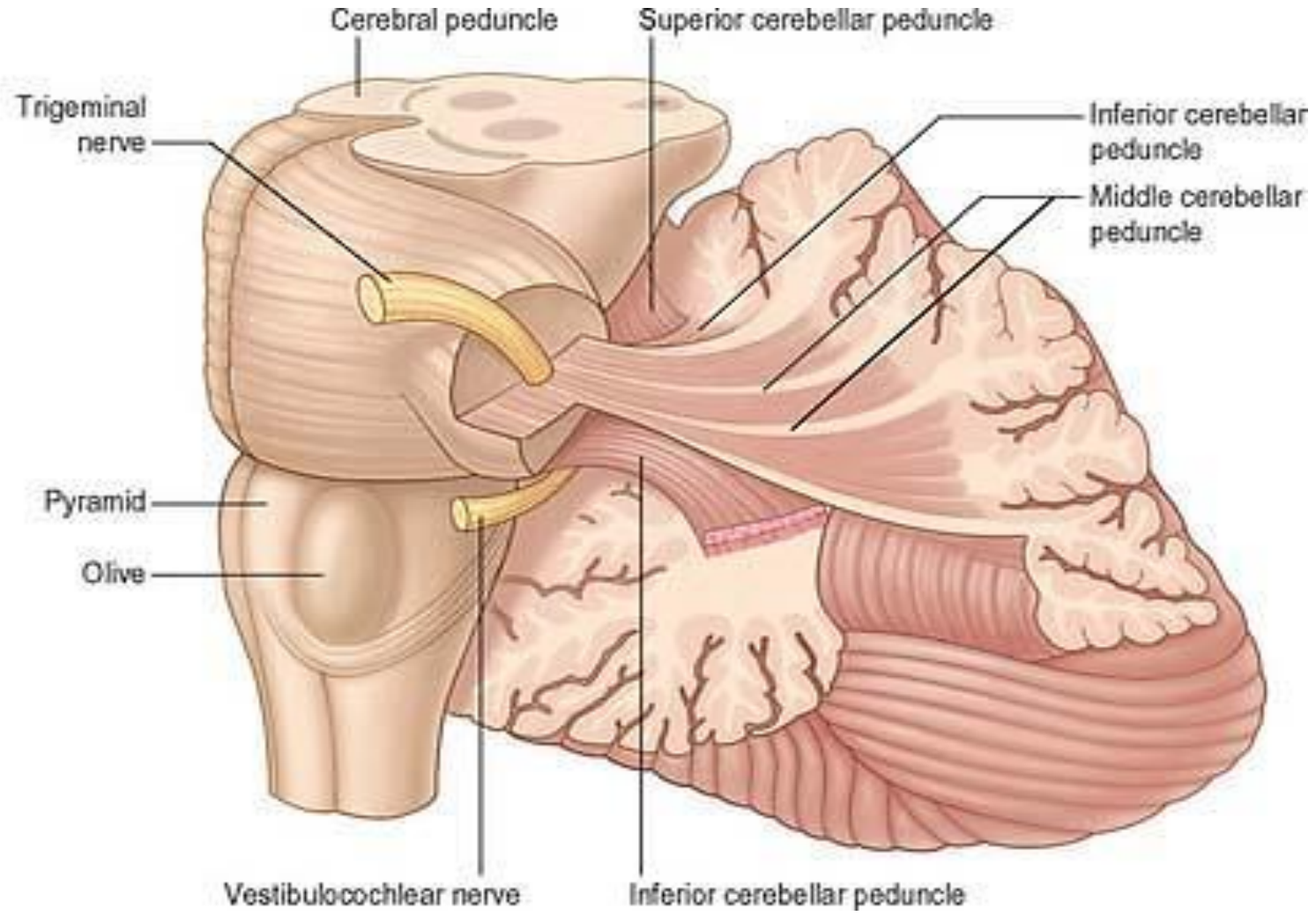
Medial view



brainstem


Side view (outside)
Brainstem
Cerebral aqueduct
midbrain
Pons
4th ventricle
Medulla oblongata
Central canal
Spinal cord
Side view (inside)

brainstem


Cerebral peduncle
Superior cerebellar peduncle
Trigeminal nerve
Inferior cerebellar peduncle
Middle cerebellar peduncle
Pyramid
Olive
Vestibulocochlear nerve
Inferior cerebellar peduncle

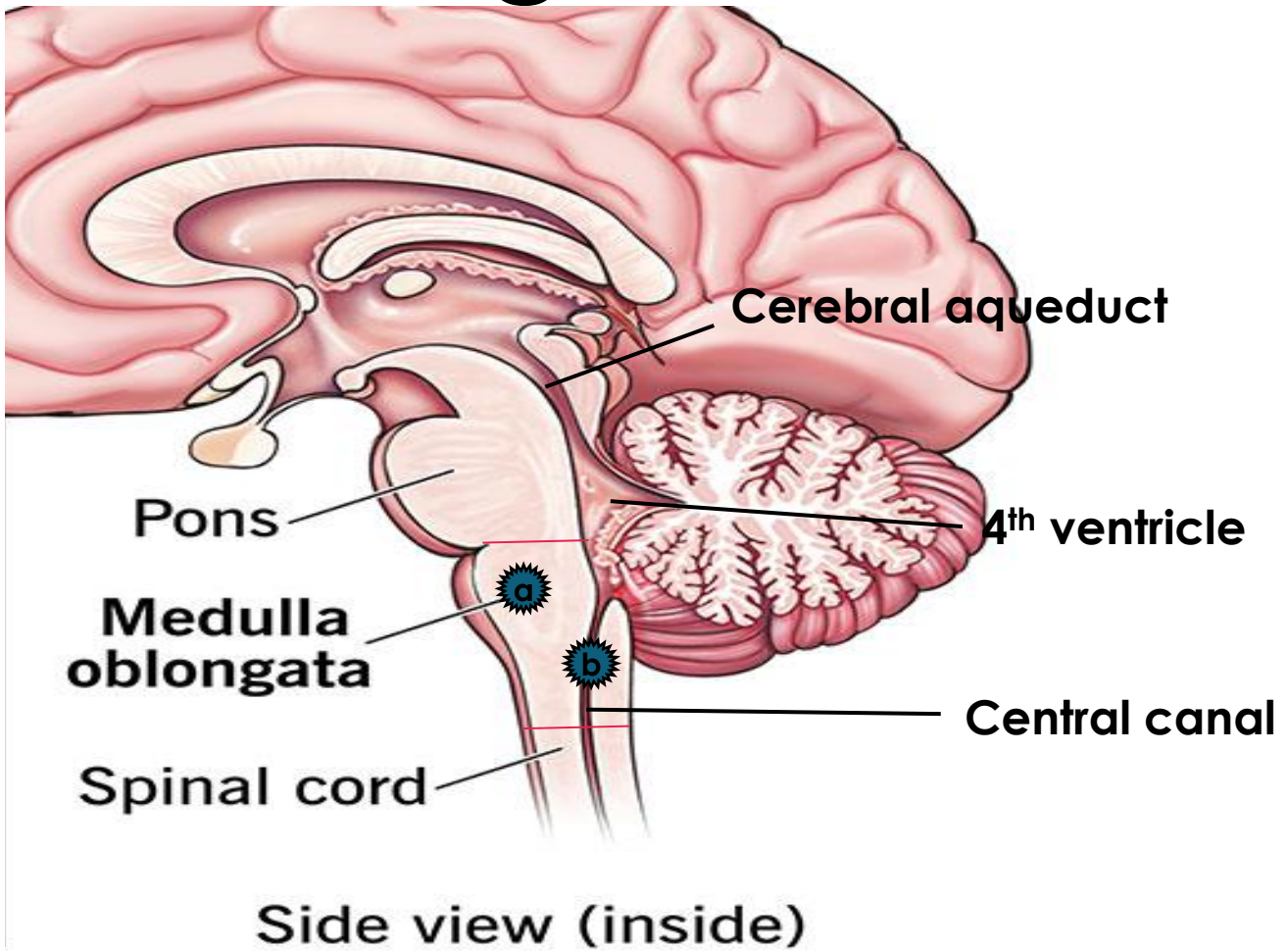
Medulla oblongata

- It forms the lower part of the brain stem
- Continues as the spinal cord

❖**It is divided into:**

a) Upper part: open medulla

b) Lower part: closed medulla



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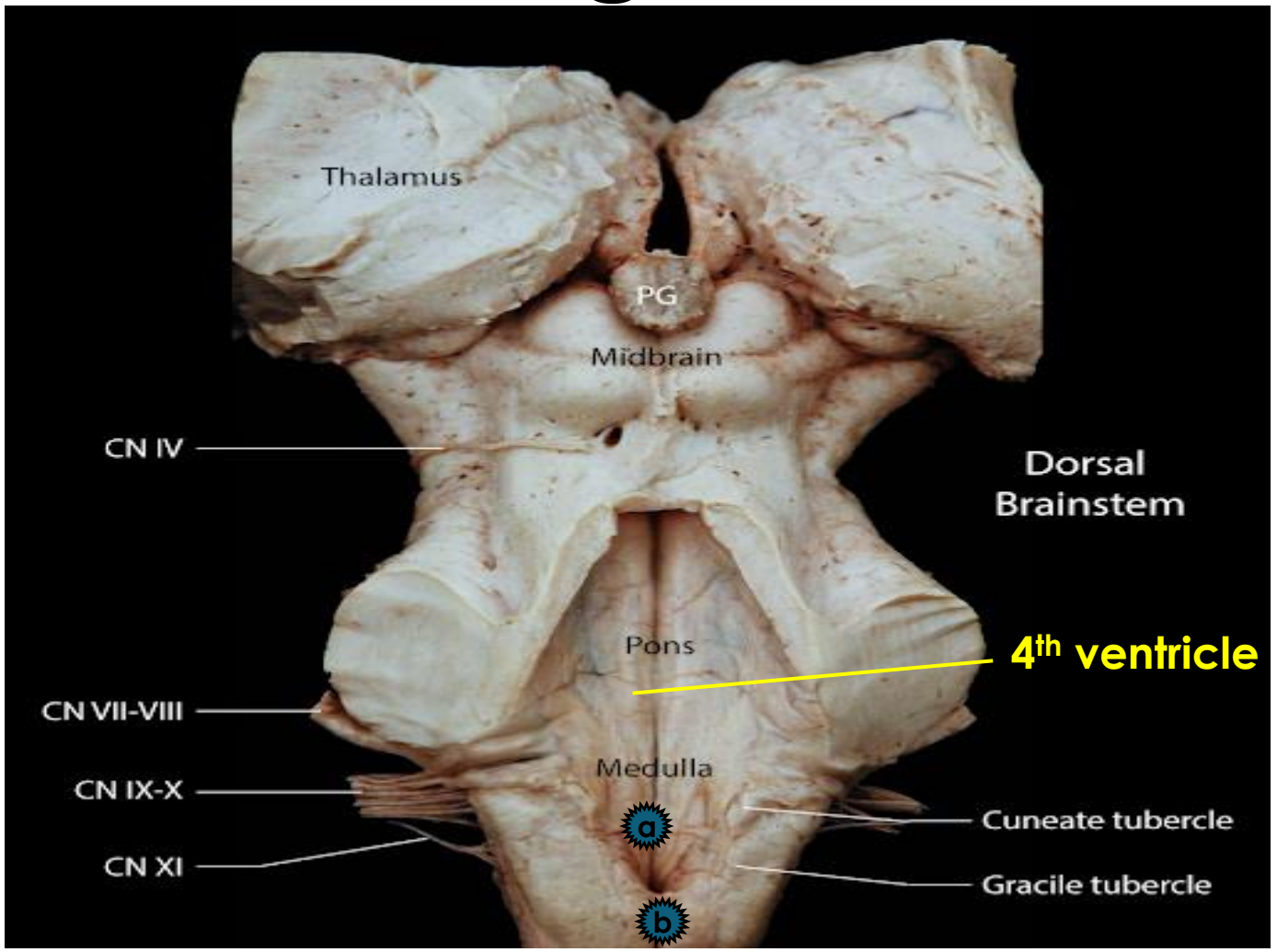


Dorsal view

Medulla oblongata

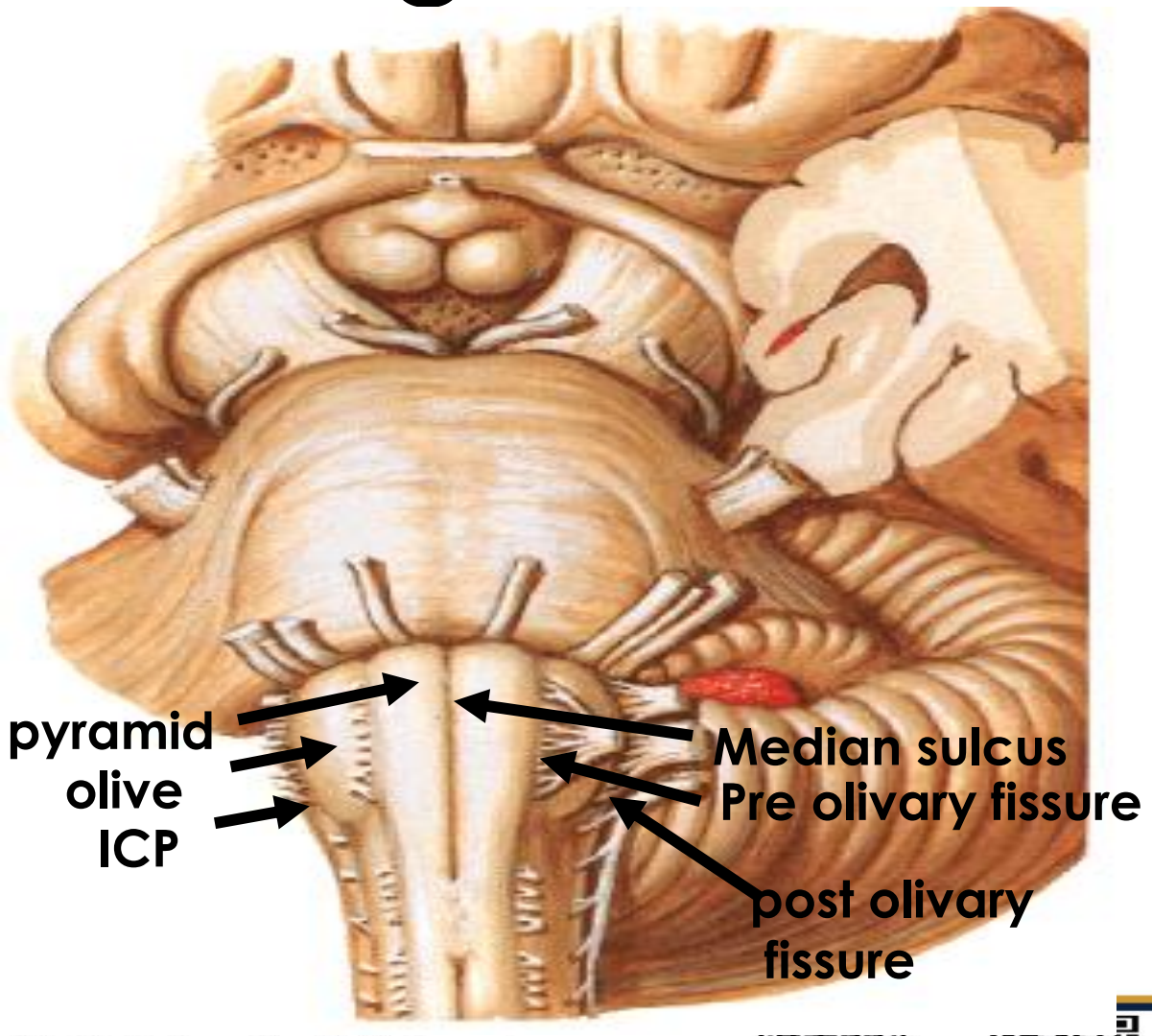
❖ Ventral Surface:

➢3 Elevations:

1. Pyramid.
2. Olive.
3. Inferior Cerebellar Peduncle.

➢3 Fissures:

1. Anterior median sulcus.
2. Pre olivary fissure.
3. Post olivary fissure.



OSPE : Identify ?

Medulla oblongata

❖ Ventral Surface:

➢3 Elevations:

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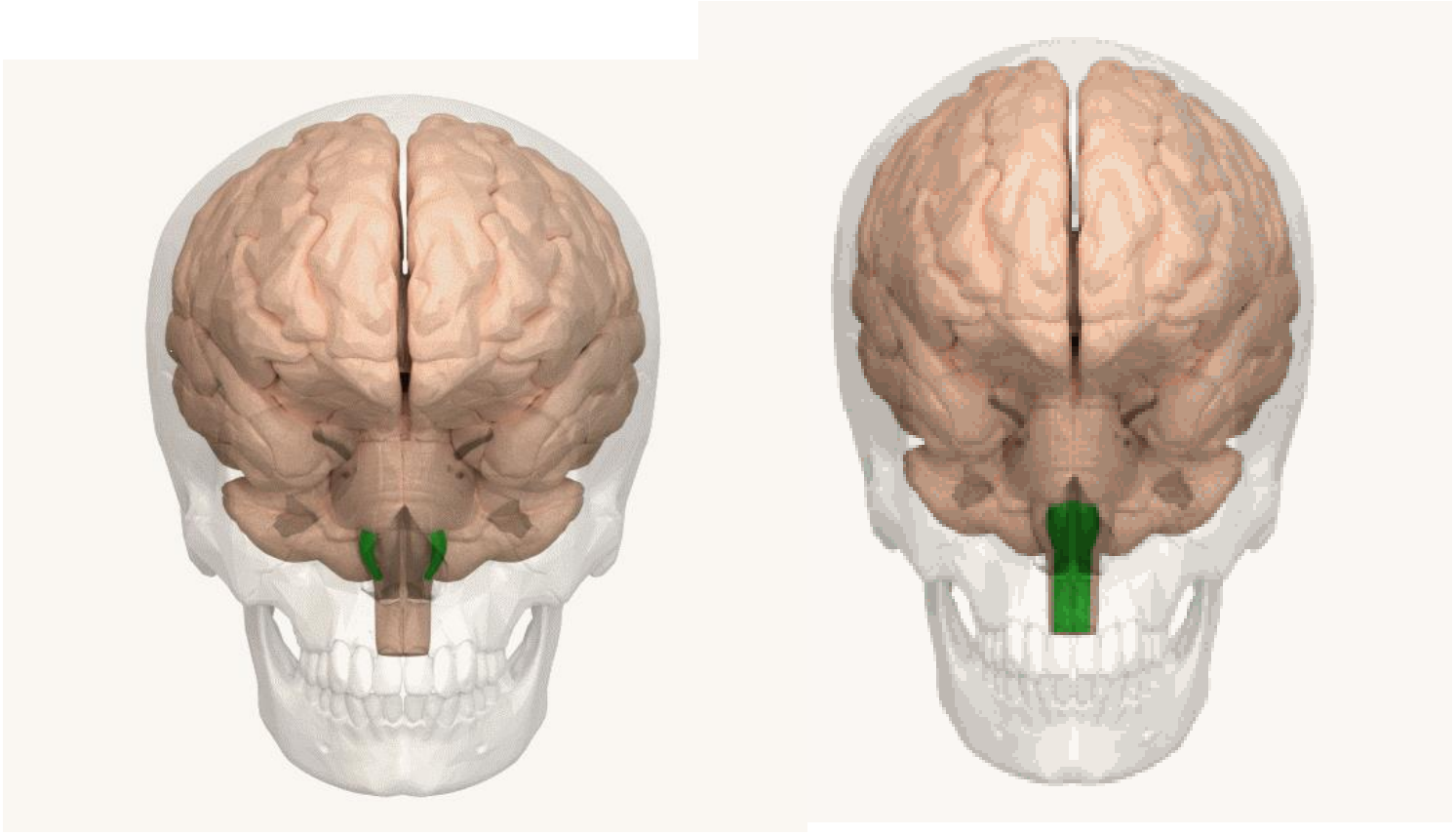


Medulla oblongata

❖Ventral Surface:

➢ Exit of the lower 4 cranial nerves:

A. Post olivary fissure: from above downward

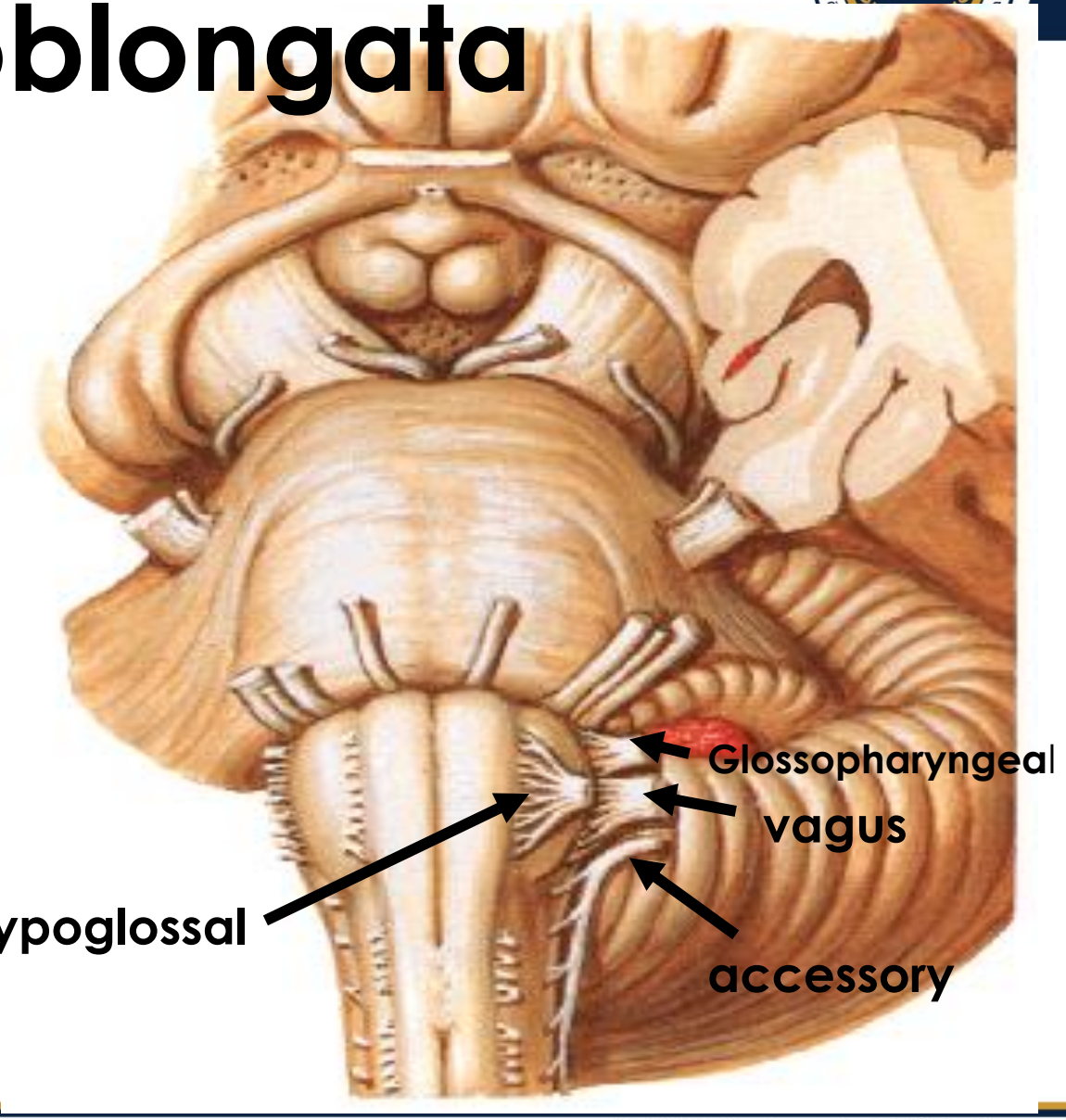
1-Glossopharngeal nerve 9

2-Vagus nerve 10

3-Crainal accessory nerve 11

B. Pre olivary fissure:

1- hypoglossal nerve 12



OSPE : Identify ?

N.B : Jugluar Forman is site of exit CN9, 10 , 11

OSPE : Identify ?
N.B : Trigones مهم جدا!!!

❖ Dorsal Surface:

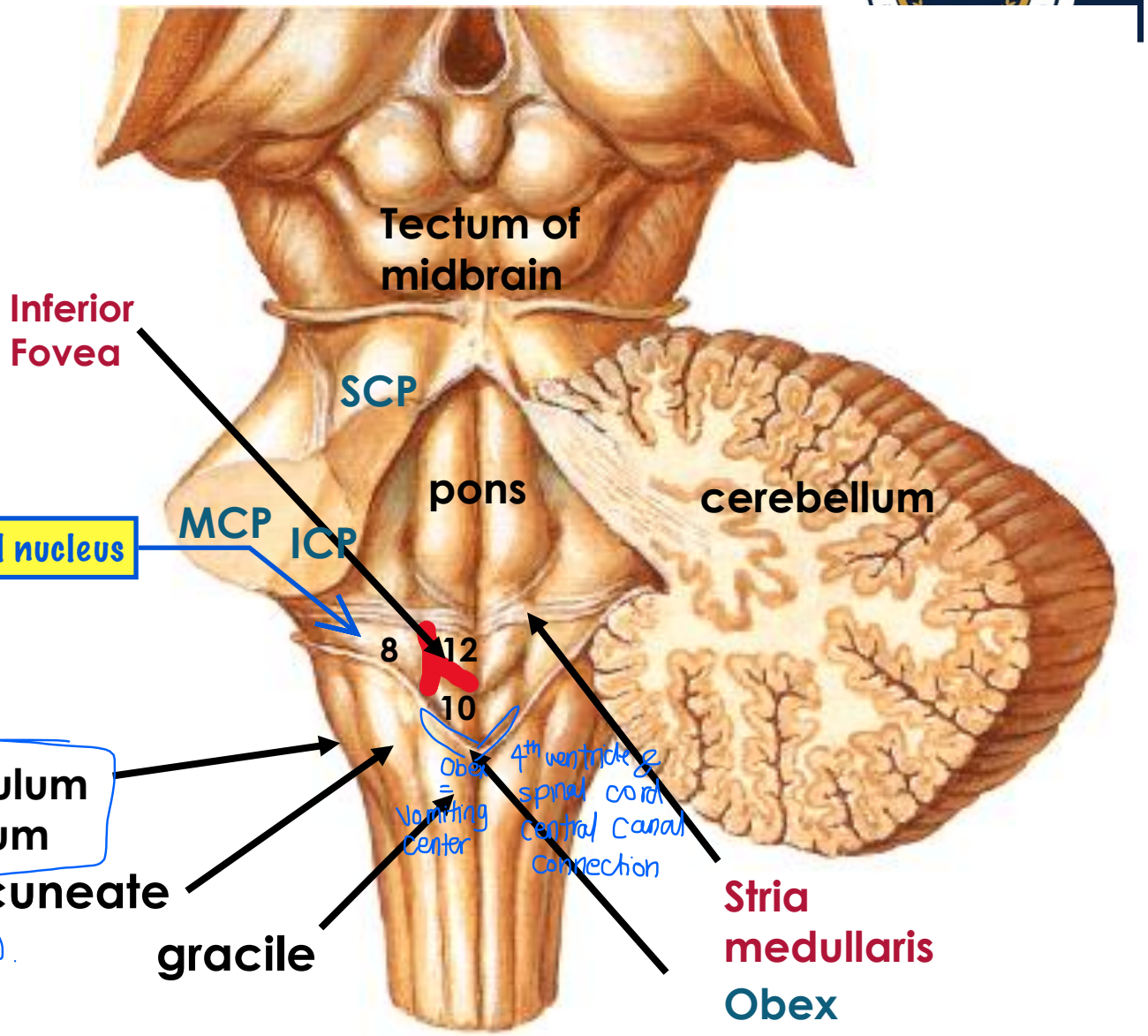
➢ Closed medulla:

- Gracile.
- Cuneate.
- Tuberculum cinereum.

➢ Open medulla:

- Inferior Fovea. مهمة جدا ومتكررة في الامتحانات
  - Hypoglossal trigone (12)
  - Vagal trigone (10)
  - Vestibular trigone (8).
- Area postrema (Obex).
- Stria medullaris of 4th ventricle

Contain Inferior & medial nucleus

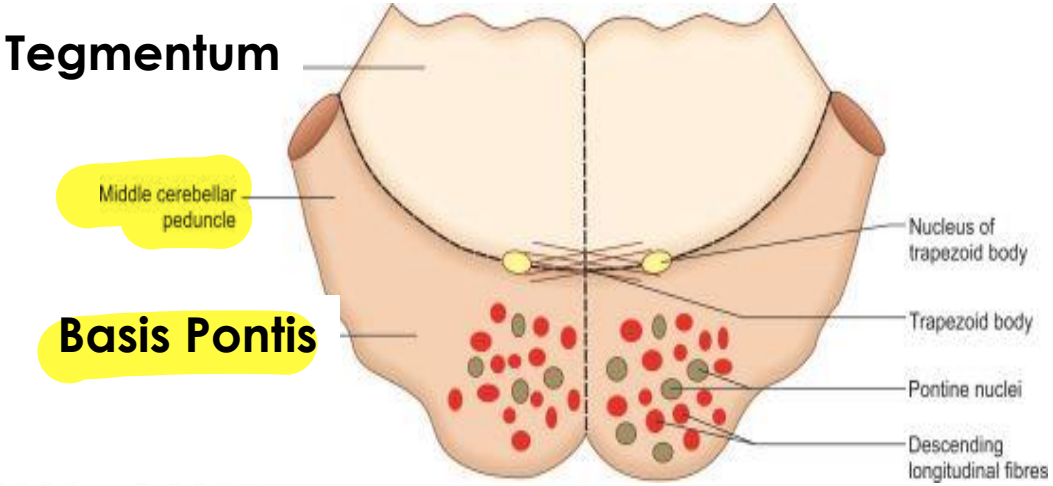


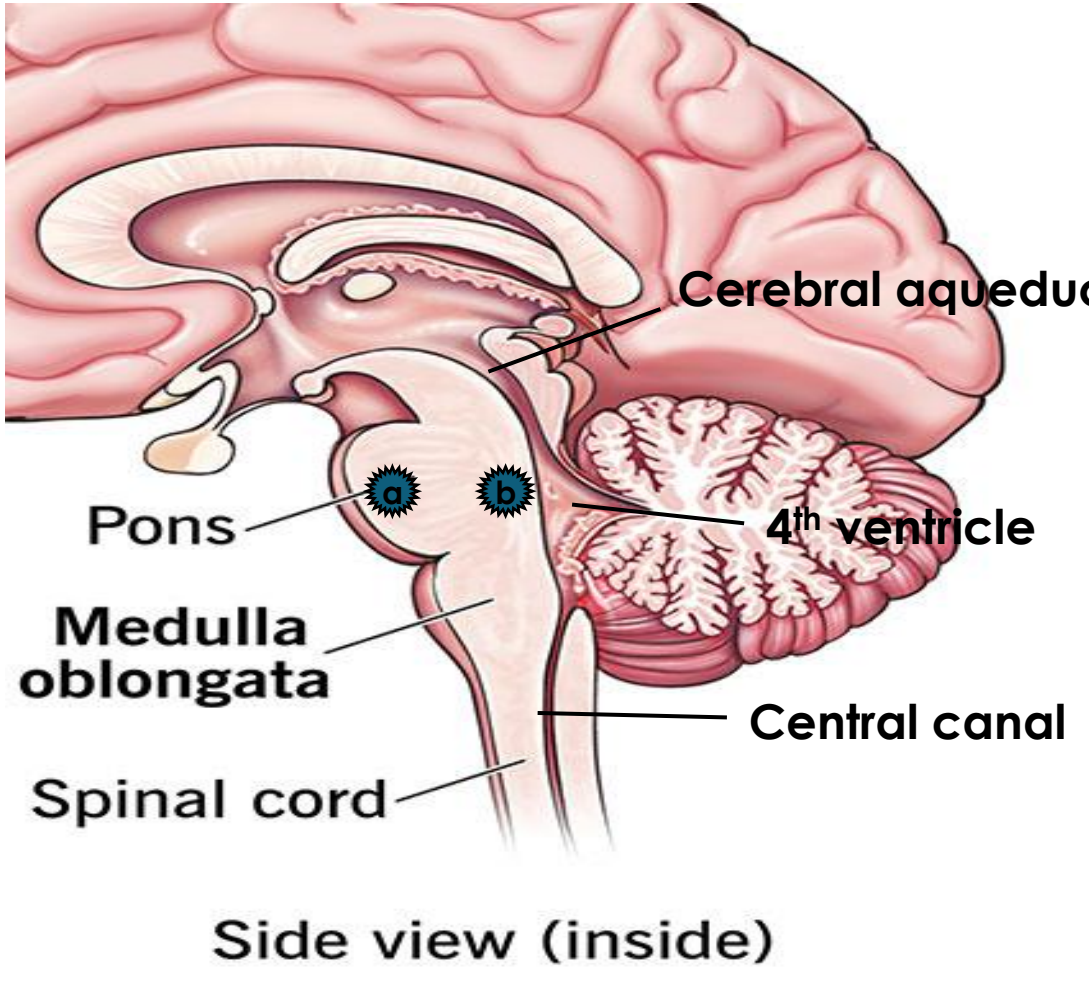
Pons

- Extent :Between midbrain and medulla.
- Divided into:

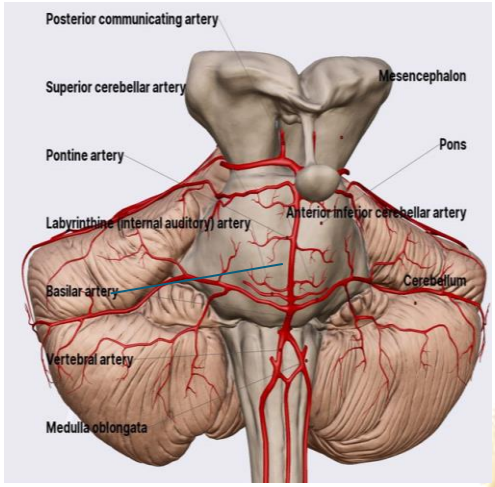
a) Ventral part: Basis Pontis

b) Dorsal part: Tegmentum



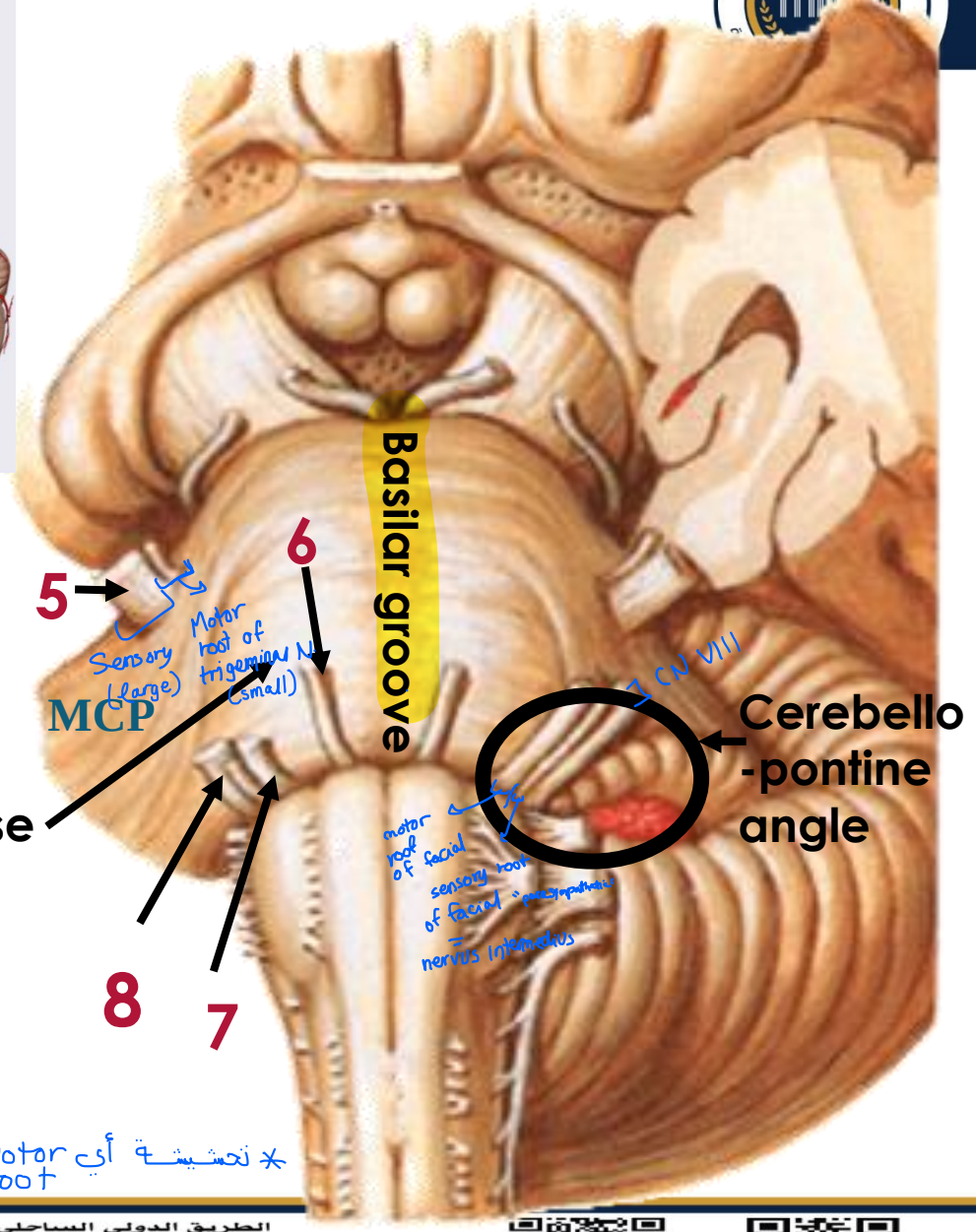


Pons



❖ Ventral Surface:

- ➢ Basilar groove.
- ➢ Transverse pontine fibers forming MCP.
- ➢ Exit of the middle 4 cranial nerves (V&VI&VII&VIII).



OSPE : Identify roots of trigeminal & Facial Nerve ومهم نعرف ال

OSPE مهم : Contents of cerebellopontine angle ?

N.B : Abducent nerve arise () pyramid in medulla & pons

Pons

❖ Dorsal Surface:

1. Medial eminence & facial colliculus:

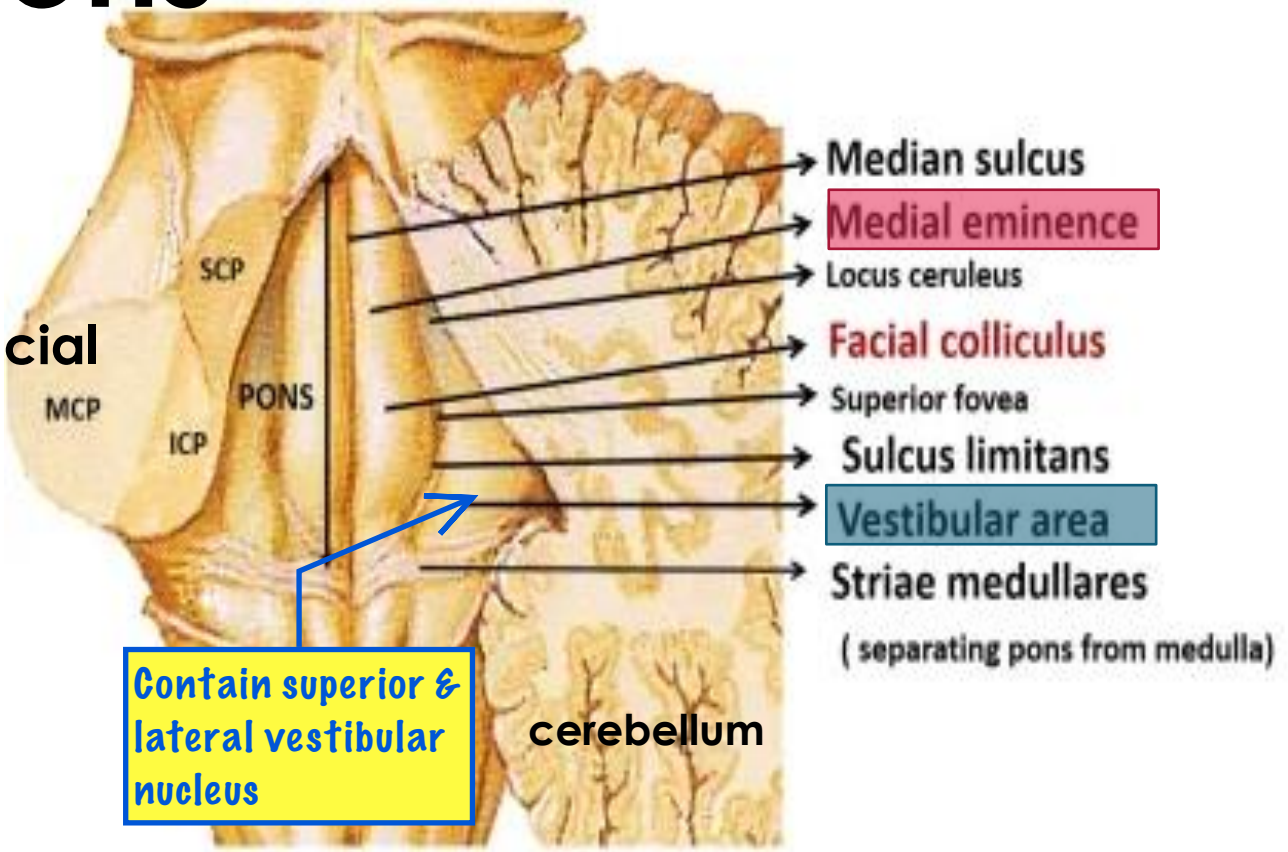
it overlies <u>abducent nucleus</u> surrounded by facial fibers.

2. Vestibular area:

It overlies vestibular nuclei.

3. Sulcus limitans (superior fovae):

It contains in the upper part pigmented area (Locus ceruleus). ← Secrete NE



7
6

OSPE : Identify (Any feature)
OSPE مهم : Facial colliculs formed by ?
N.B : Site of vestibular nuclei مهم

The midbrain

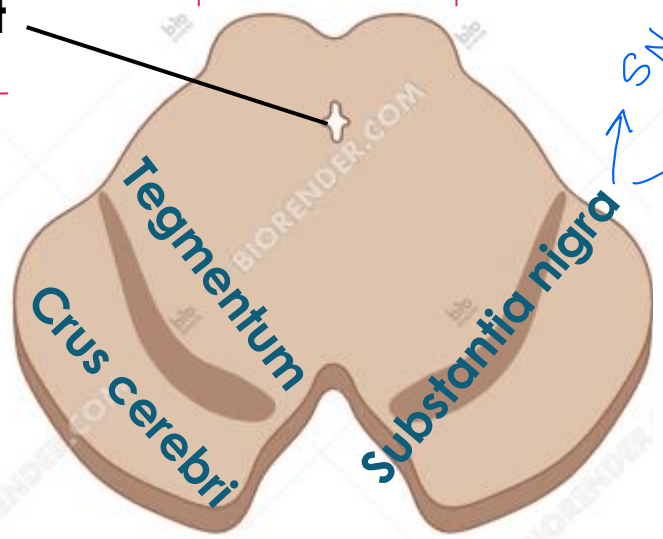
dorsal surface

(tectum formed of 4 colliculi)

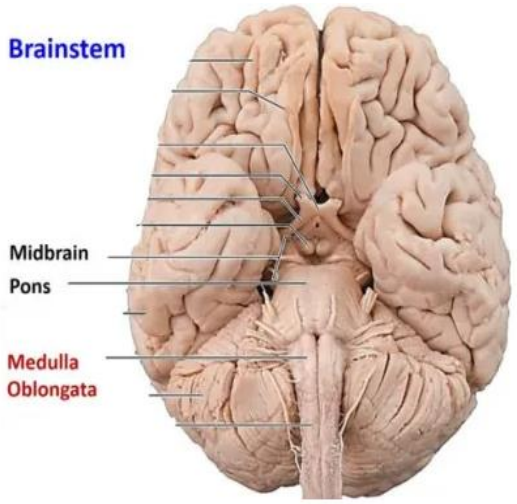
Cerebral aqueduct

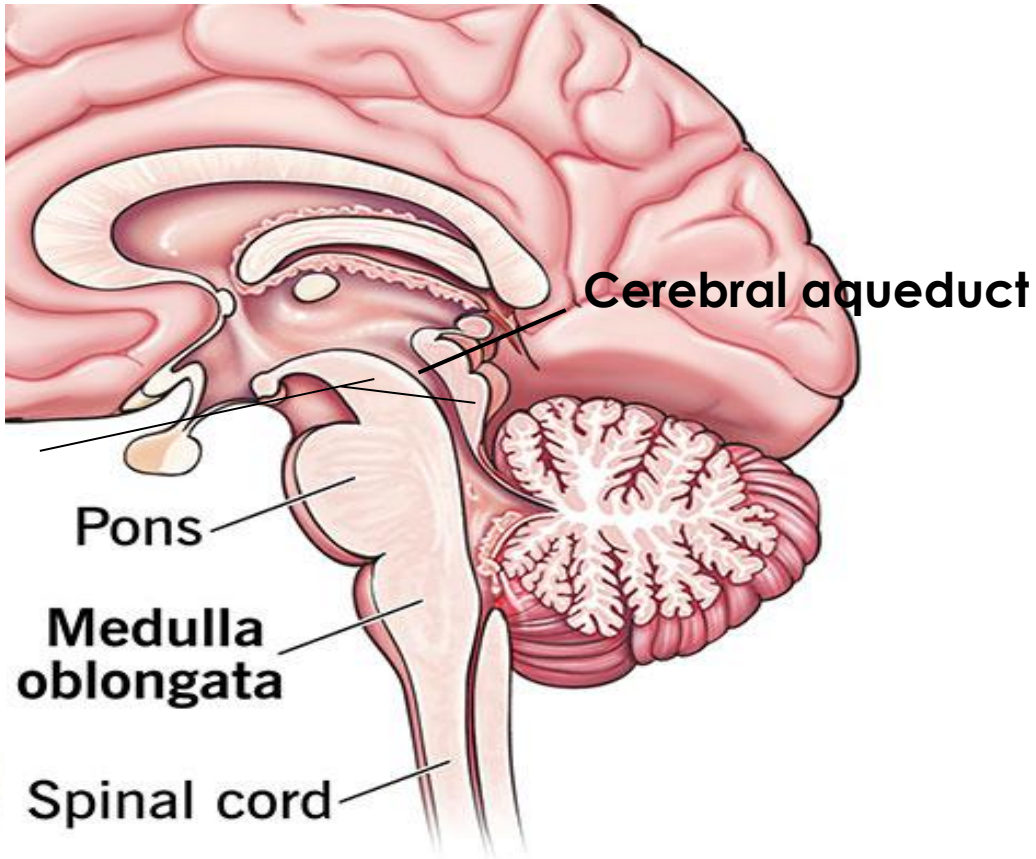
ventral surface

(2 Cerebral Peduncles)



midbrain

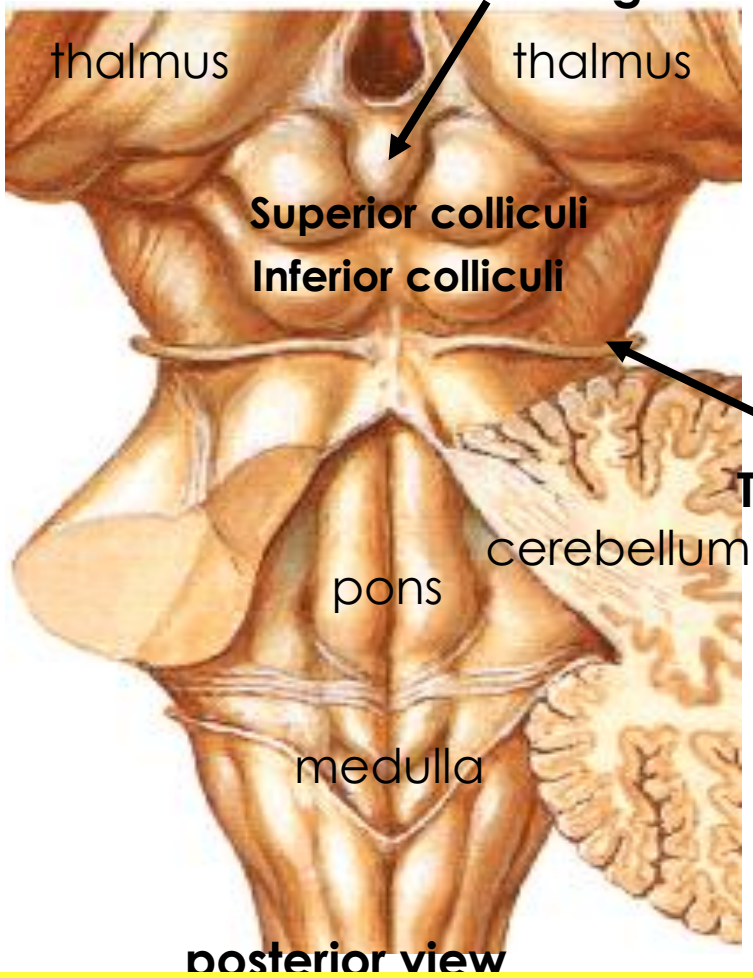


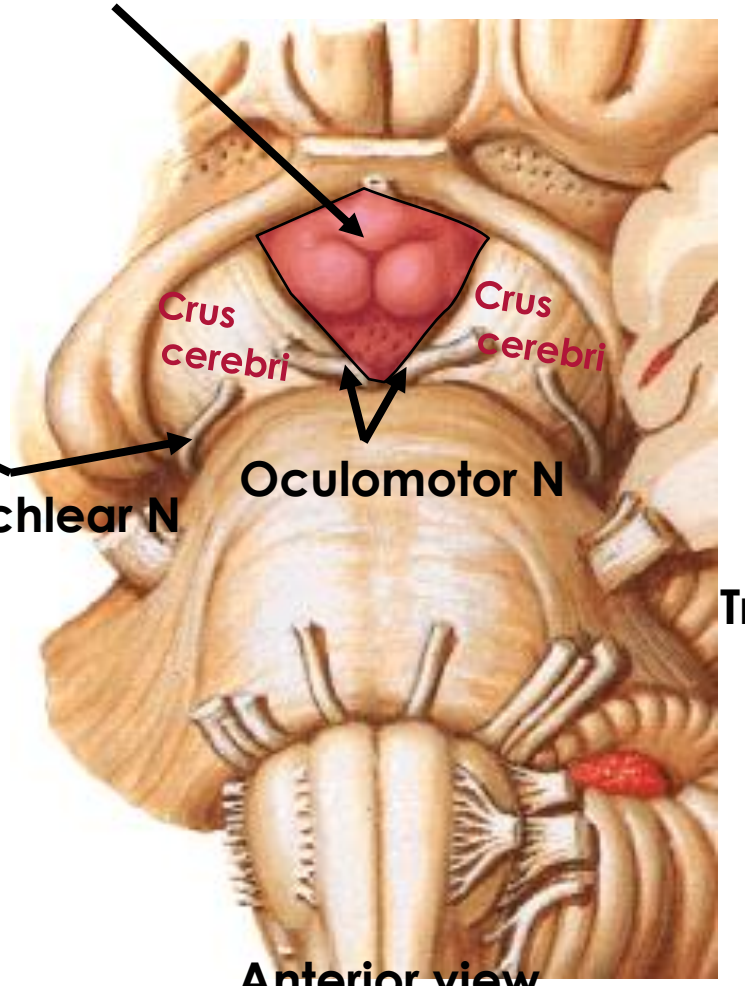


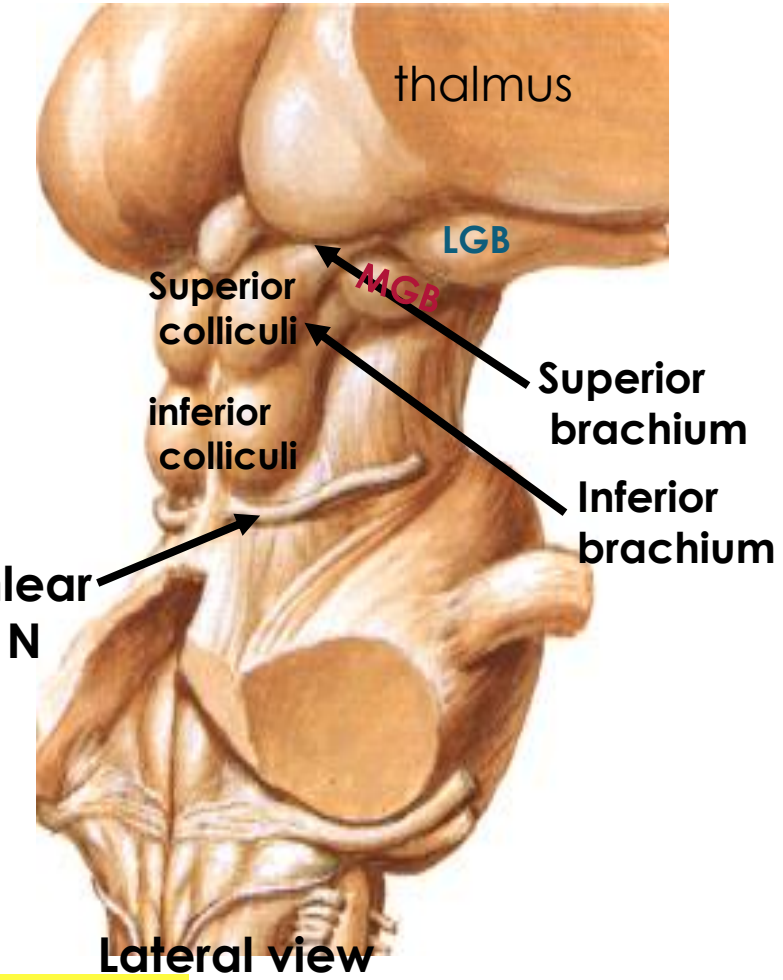
Side view (inside)

The midbrain

* N.B : Occulomotor nerve (medial 2 cerebral peduncle in Interpeduncular fossa)
* Trochlear nerve (lateral + dorsal of brain stem)







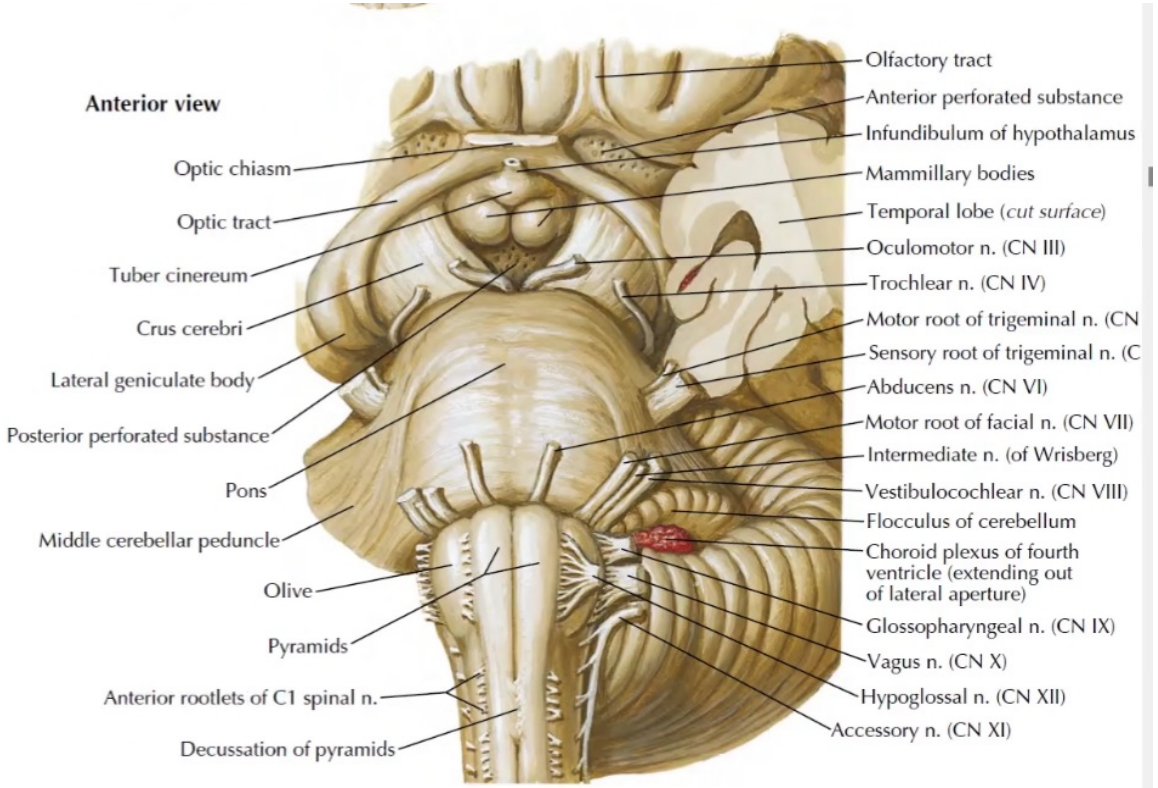
OSPE : Identify ?

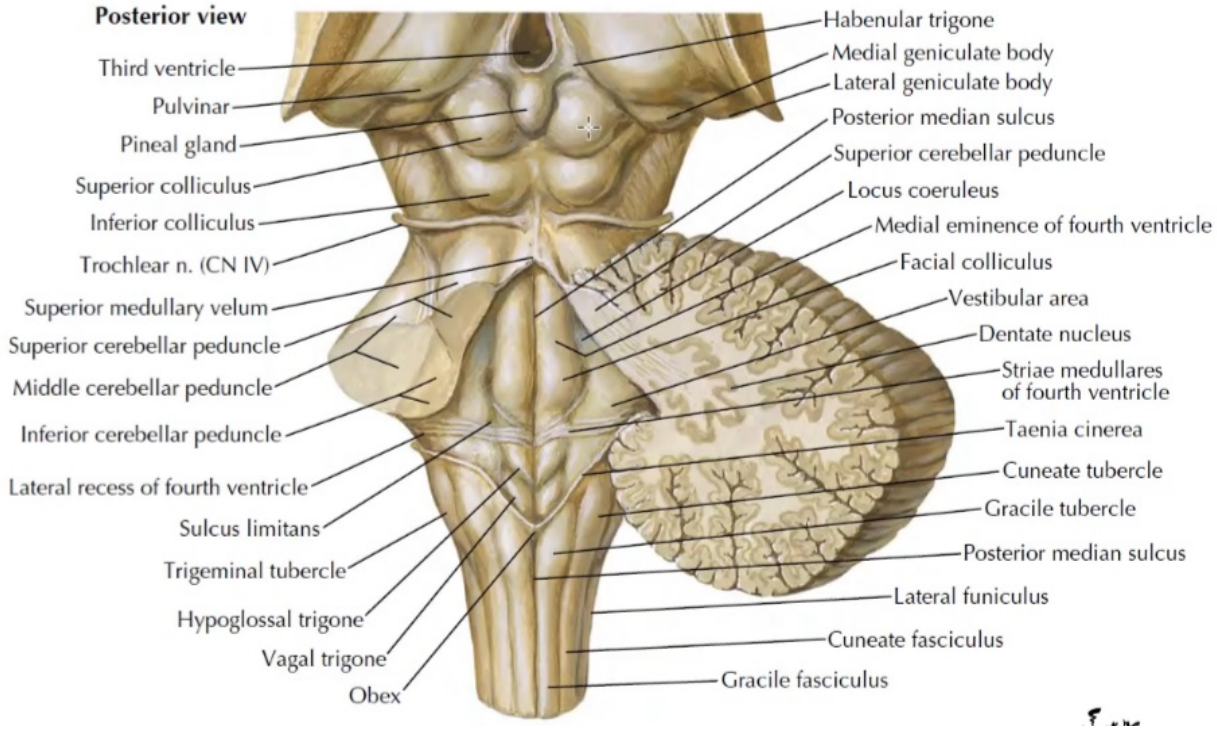
OSPE مهم جداااا : Contents of interpeduncular fossa :

A) Circule of Willis - tuber cinerium & infundibulm - mammillary bodies - posterior perforated substance - occulomotor nerve

N.B :

- Superior colliculi connected to LGB by Superior brachium
- Inferior colliculi connected to MGB by Inferior brachium





WITH NOTES

Anatomy of cerebellum & 4th ventricle

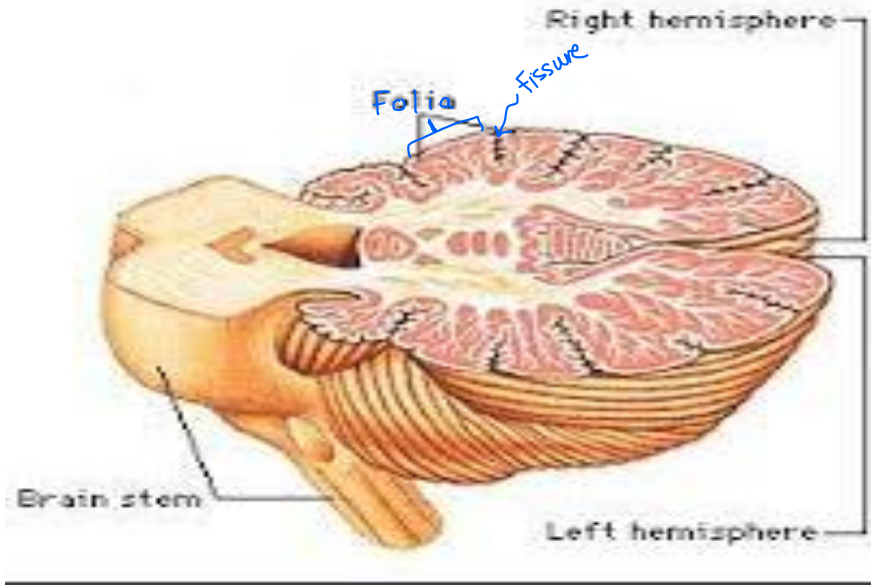
Dr Dina Hany

Department of human Anatomy and Embryology
Faculty of Medicine
Mansoura National University, Egypt

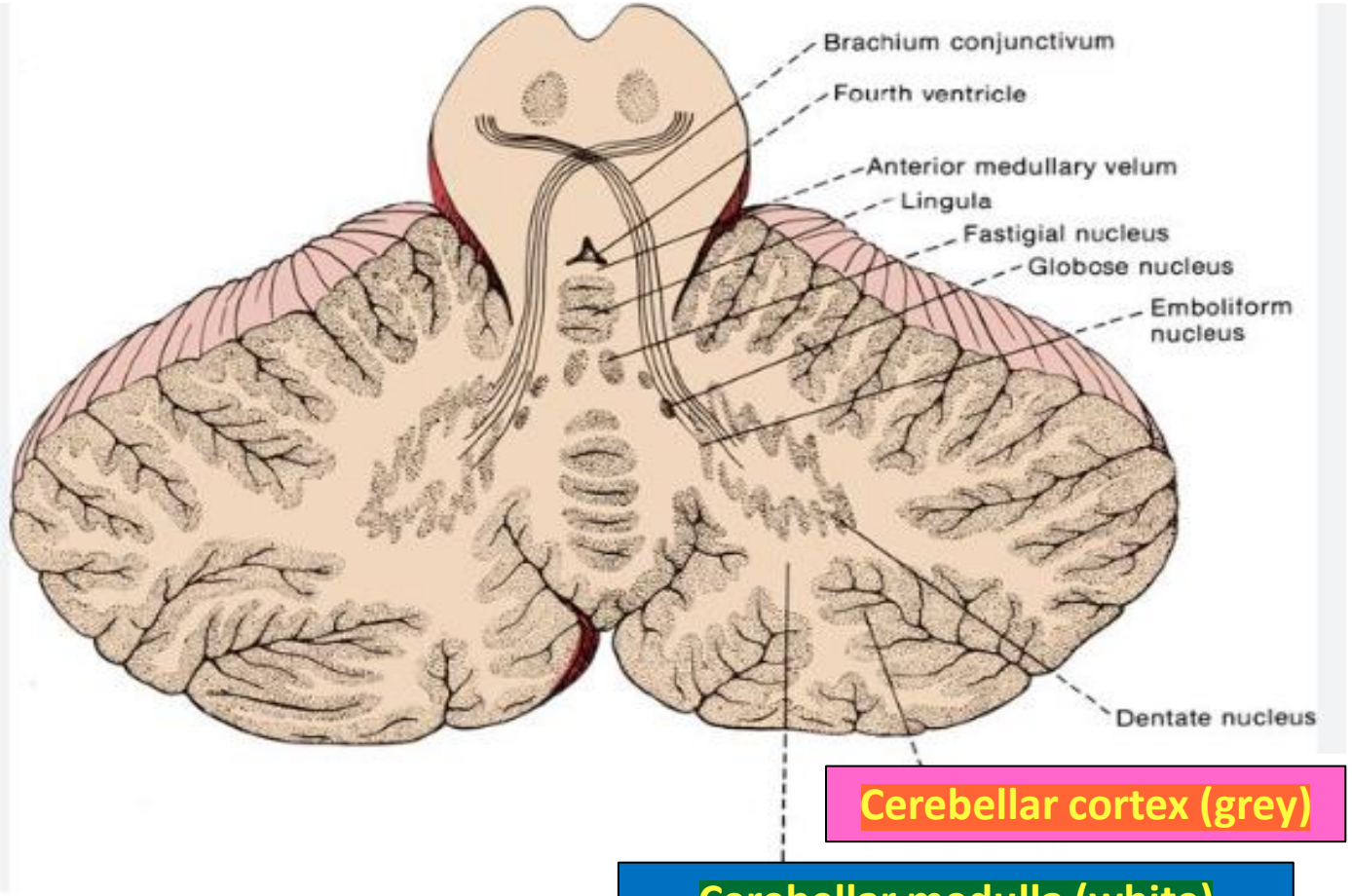
OSPE :

1- Identify (any cerebellum feature)

cerebellum

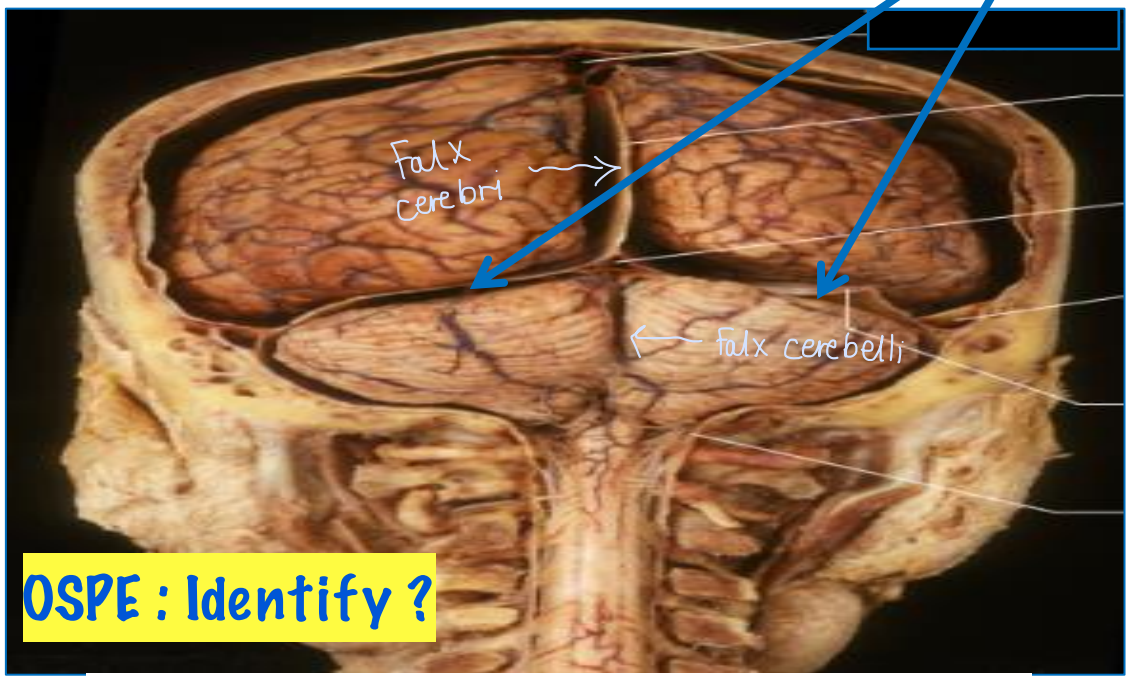


Cerebellar cortex has many gyri called folia separated by deep fissures

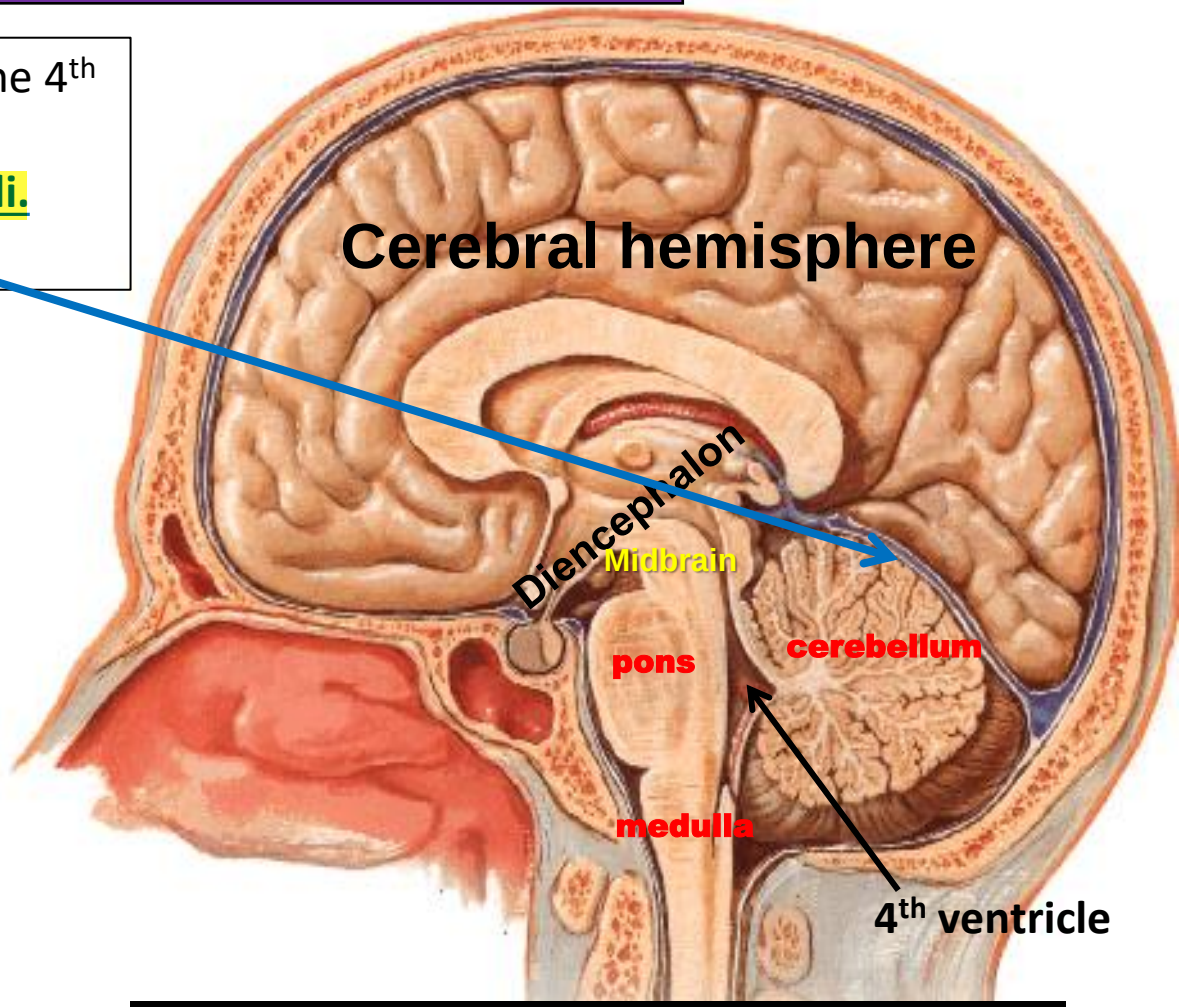


cerebellum

- **It is separated from** the pons and medulla by the cavity of the 4th ventricle.
- **It is separated from** the cerebrum by the **tentorium cerebelli.**



Coronal section



Sagittal section, medial view

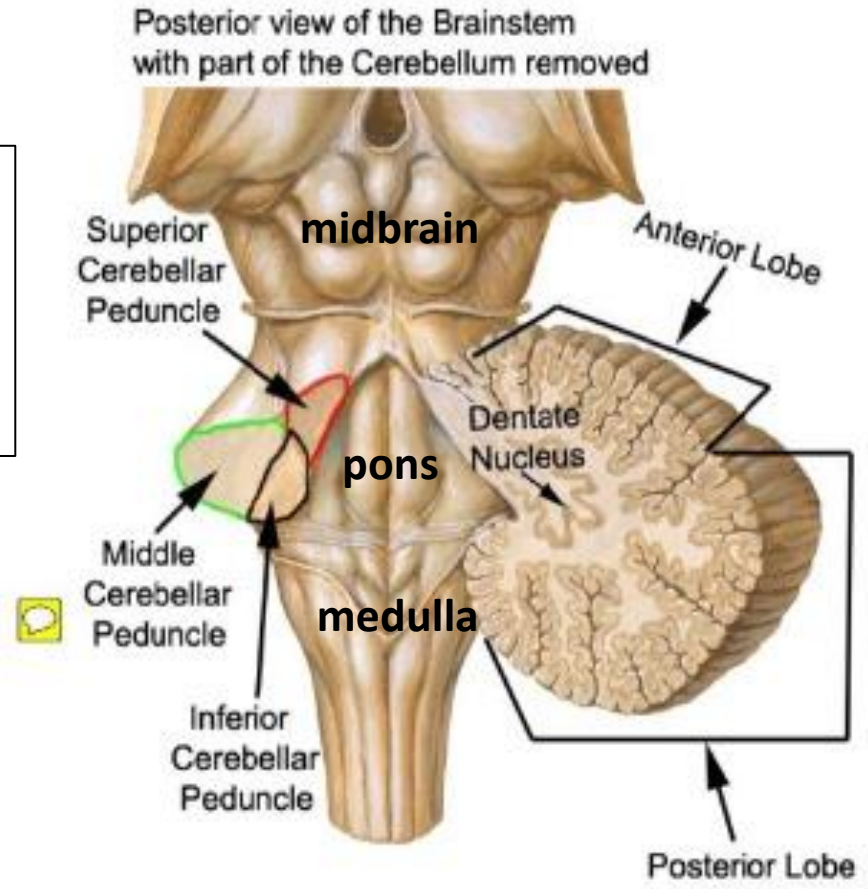
N.B : Site of cerebellum : Posteroinferior part of cranial cavity in posterior cranial fossa

cerebellum

1) Gross features:

A) Cerebellar peduncles :

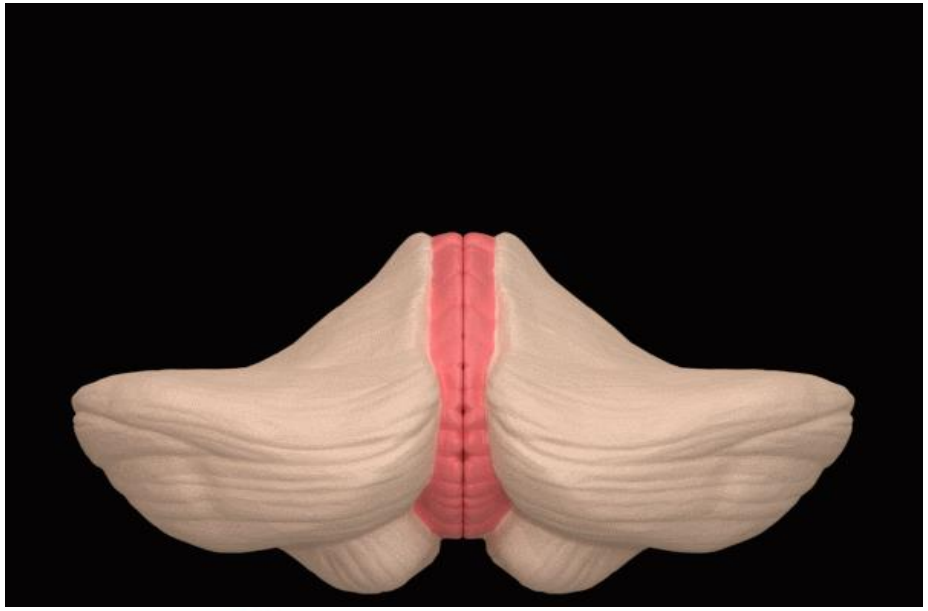
1) **Superior cerebellar peduncle:** between the midbrain and the cerebellum.
2) **Middle cerebellar peduncle:** between the pons and the cerebellum.
3) **Inferior cerebellar peduncle:** between the medulla and the cerebellum.



cerebellum

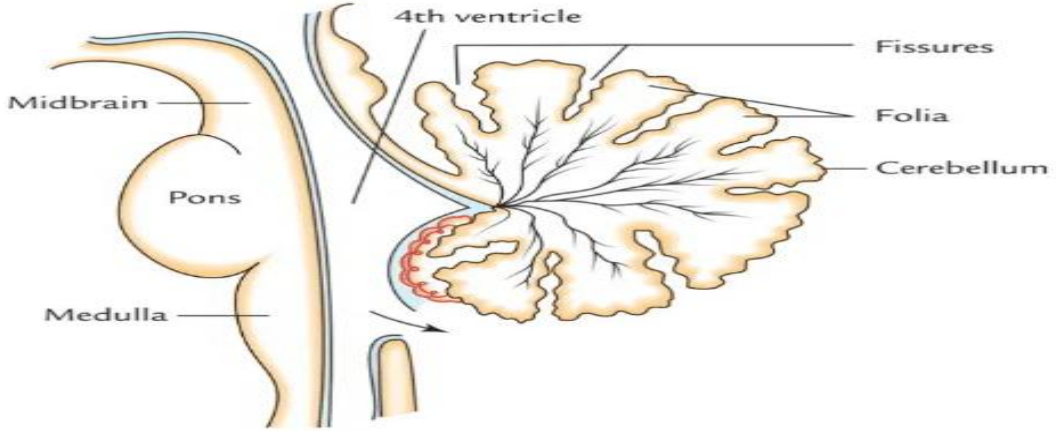
1) Gross features:

- It consists of a central part called **vermis** and **two cerebellar hemispheres**.
- The cerebellar hemisphere has many gyri called folia separated by deep fissures.



B) The vermis:

- **It is divided into superior and inferior vermis:**
  a. **The superior vermis** is present on the superior surface.
  b. **The inferior vermis:** present on the inferior surface in a groove called the **vallecula**.
- **The inferior vermis is Formed of 4 lobules:** nodule, uvula, pyramid and tuber, from before backward.
  The nodule is continuous with the flocculus.
  The uvula is continuous with the cerebellar tonsil.



cerebellum

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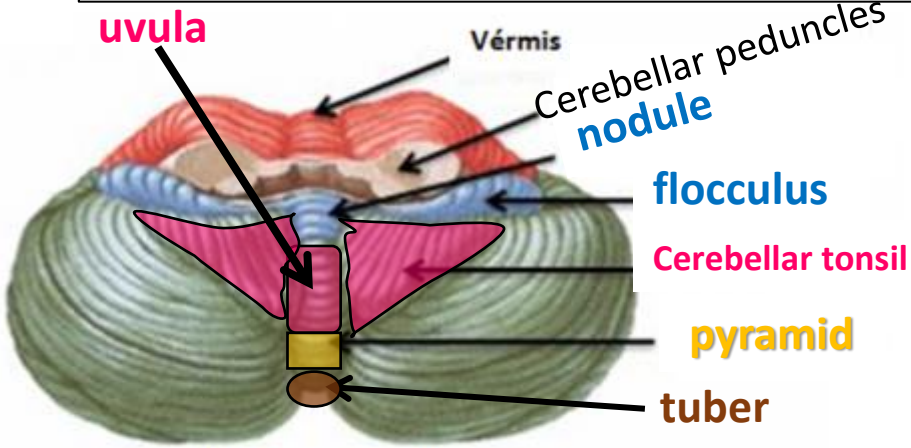
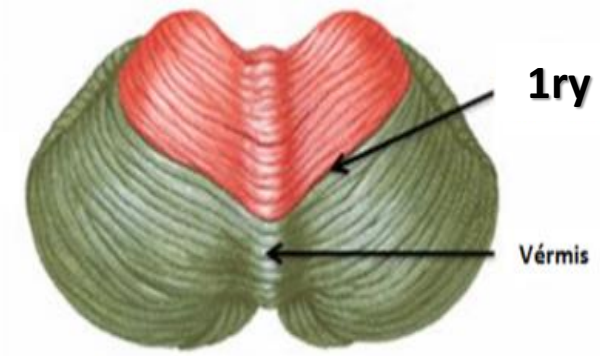
  The **nodule** is continuous with the **flocculus.**

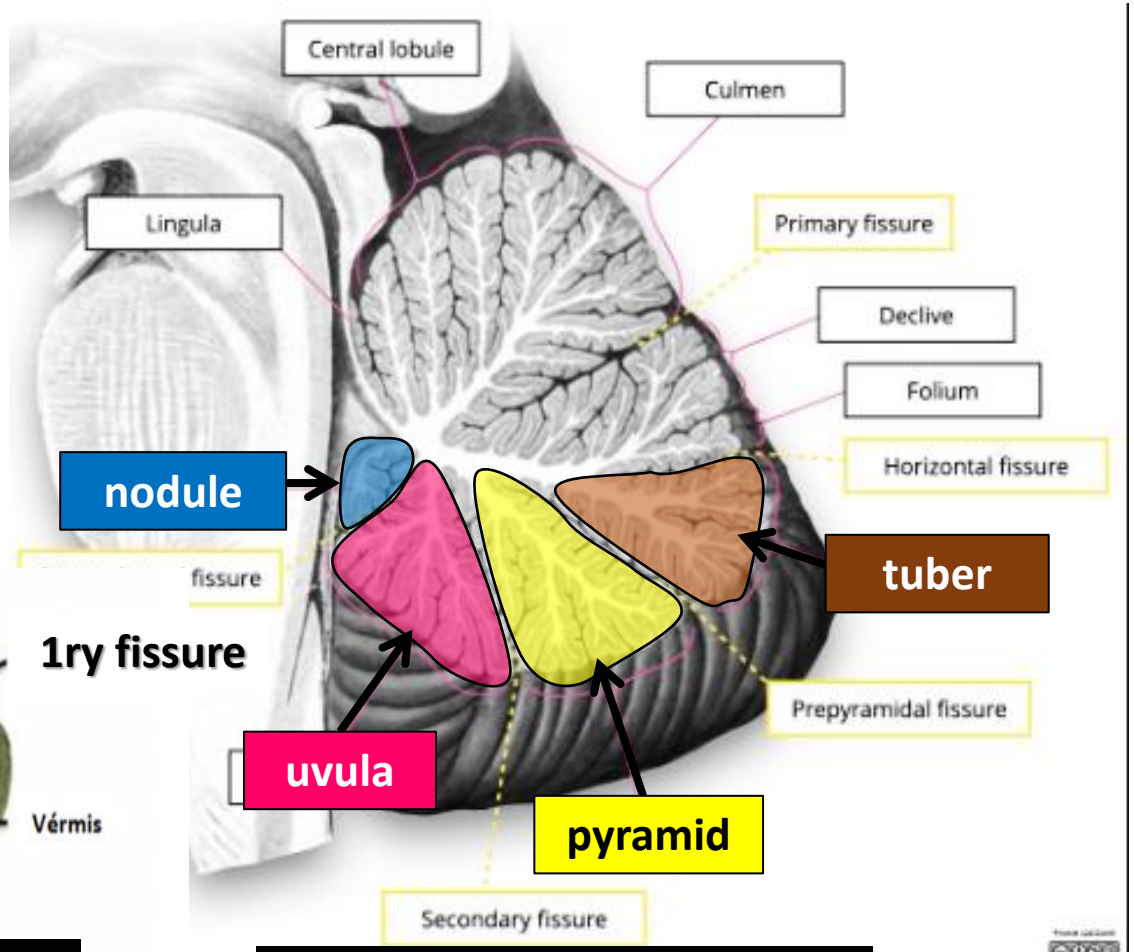
  The **uvula** is continuous with the **cerebellar tonsil.**



Antero-inferior view



superior view



lateral view

OSPE : Identify ?

N.B مهمة : Each cerebellar hemisphere control ipsilateral side of body

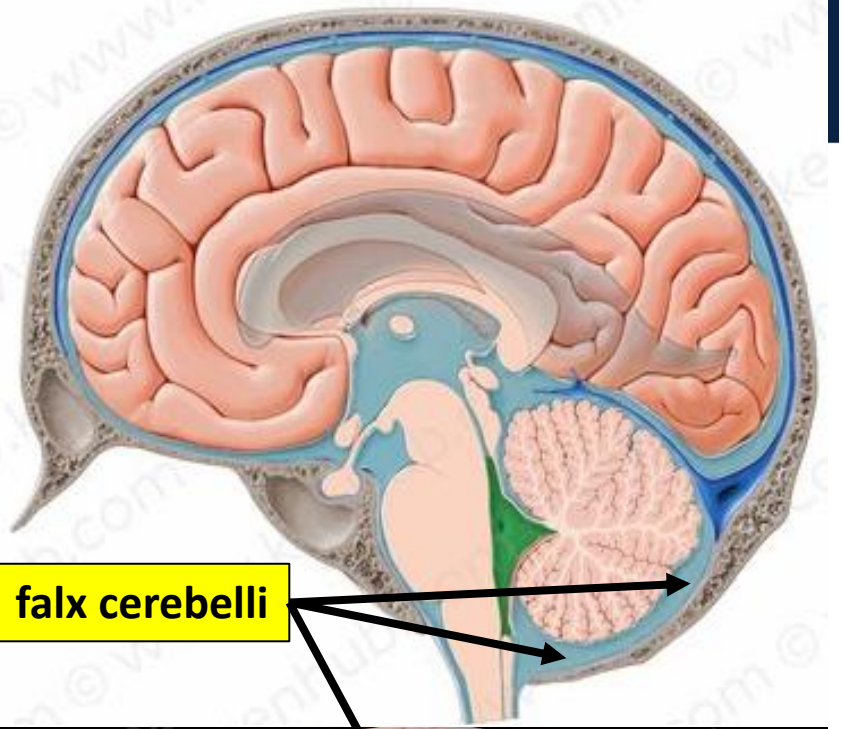
cerebellum

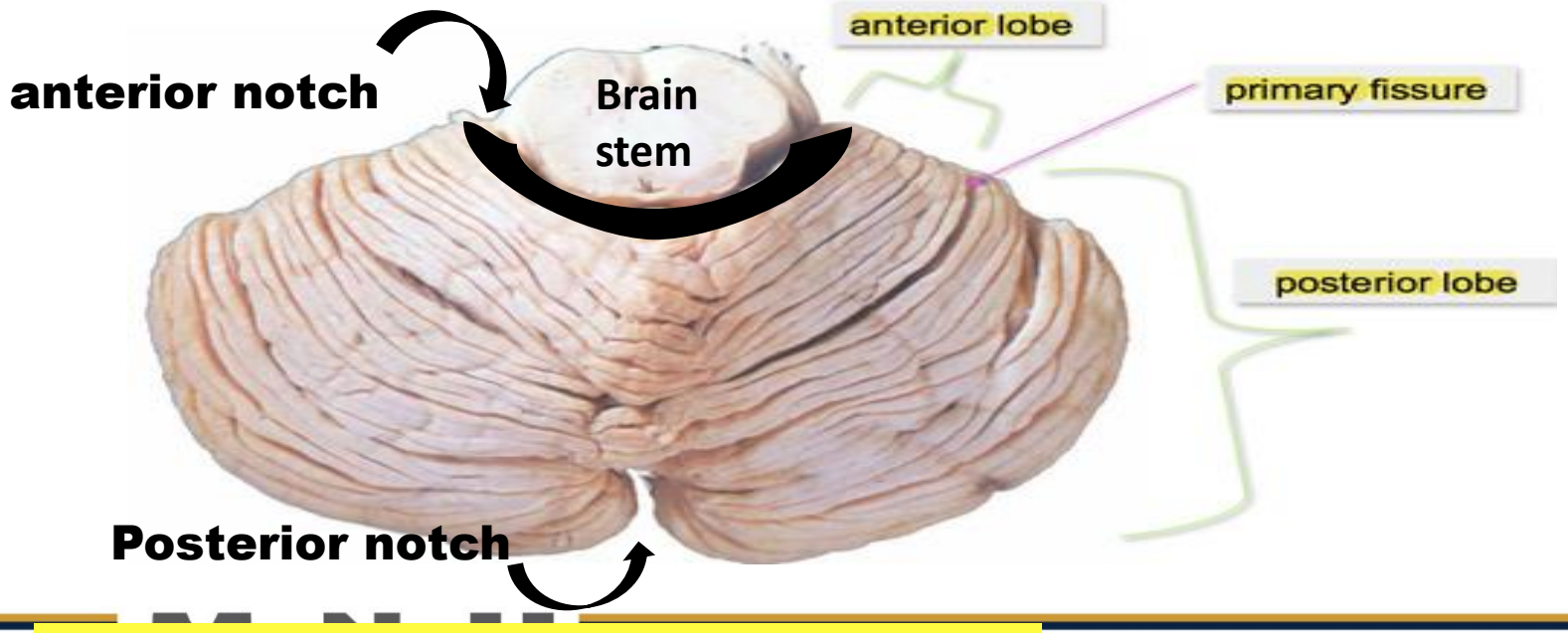
C) Notches :

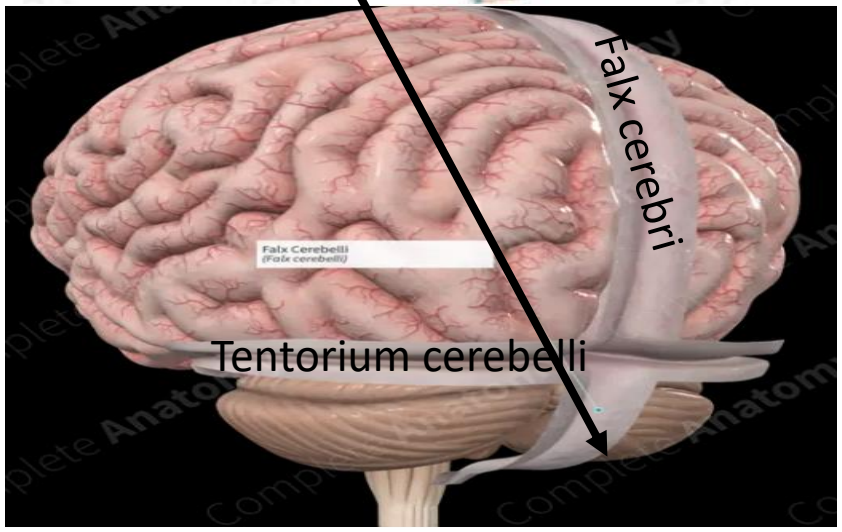
- **the cerebellum has 2 notches:**

1) **Anterior notch:** surrounds the brainstem.
2) **Posterior notch:** contains the falx cerebelli.

Separate 2 cerebellar hemisphere







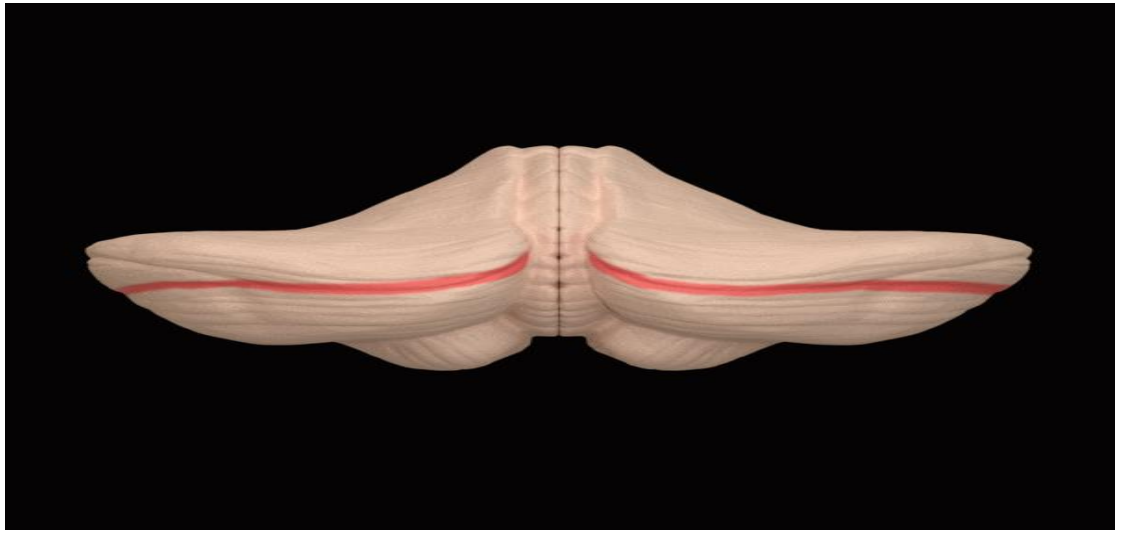
OSPE مهم : Identify & Each notch surrounds ?

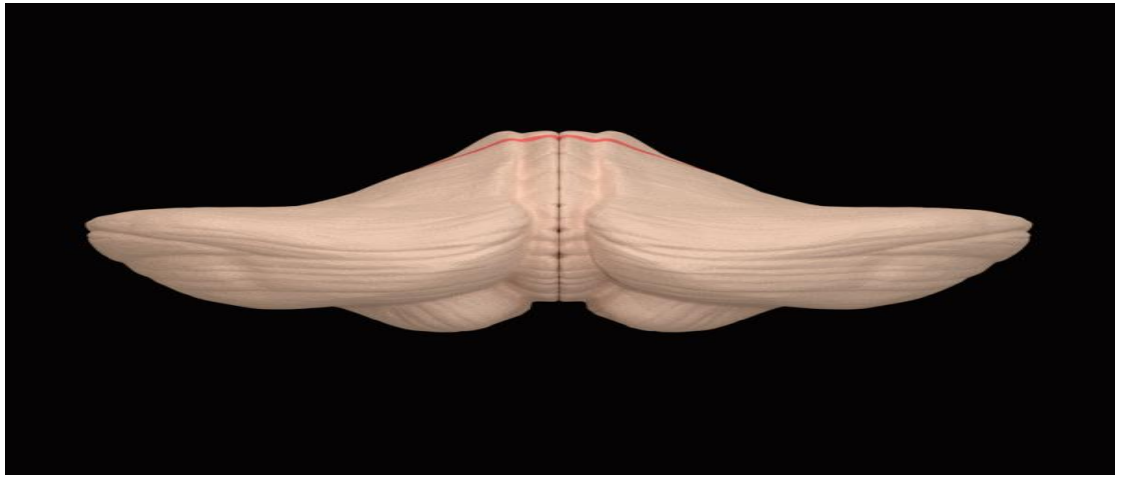
cerebellum

D) Fissures :

the 3 important fissures are:

1. **Horizontal fissure:** divides the cerebellum into superior and inferior surfaces.
2. **Primary fissure:** on the superior surface at the junction of its anterior third and posterior two-thirds. **It separates** the anterior lobe from the posterior lobe.
3. **Posterolateral fissure (uvulo-nodular fissure):** on the inferior surface separating the nodule from the uvula, and the posterior lobe from the flocculonodular lobe.



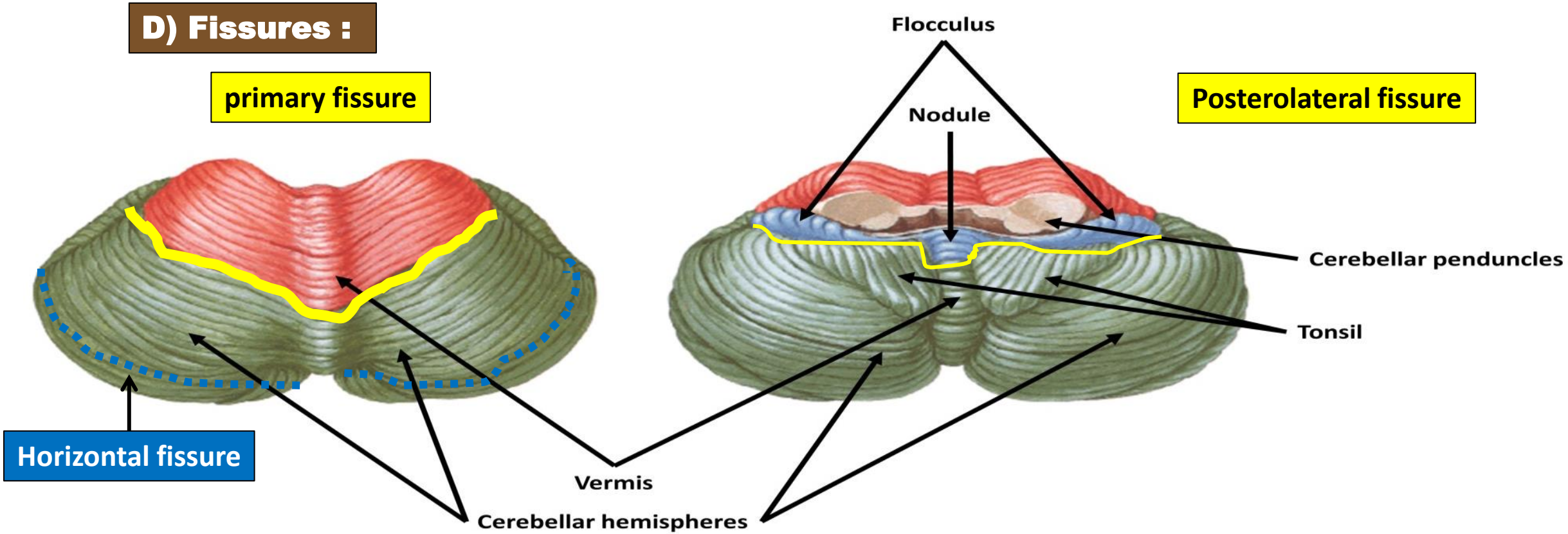


cerebellum

D) Fissures :

primary fissure

Posterolateral fissure



cerebellum

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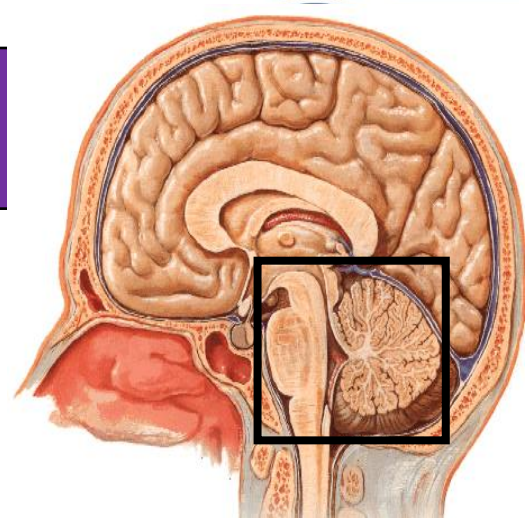
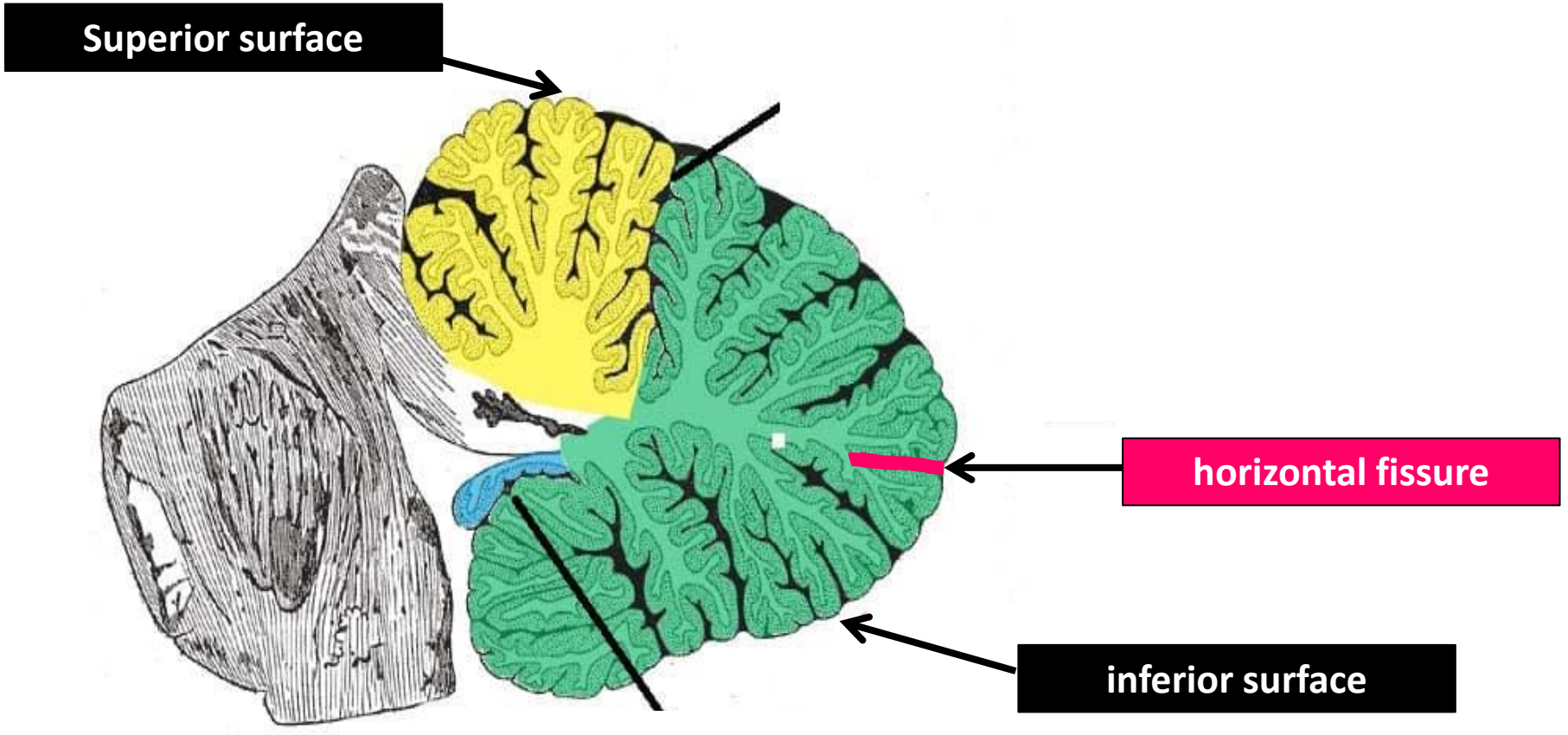
cerebellum



D) Fissures :



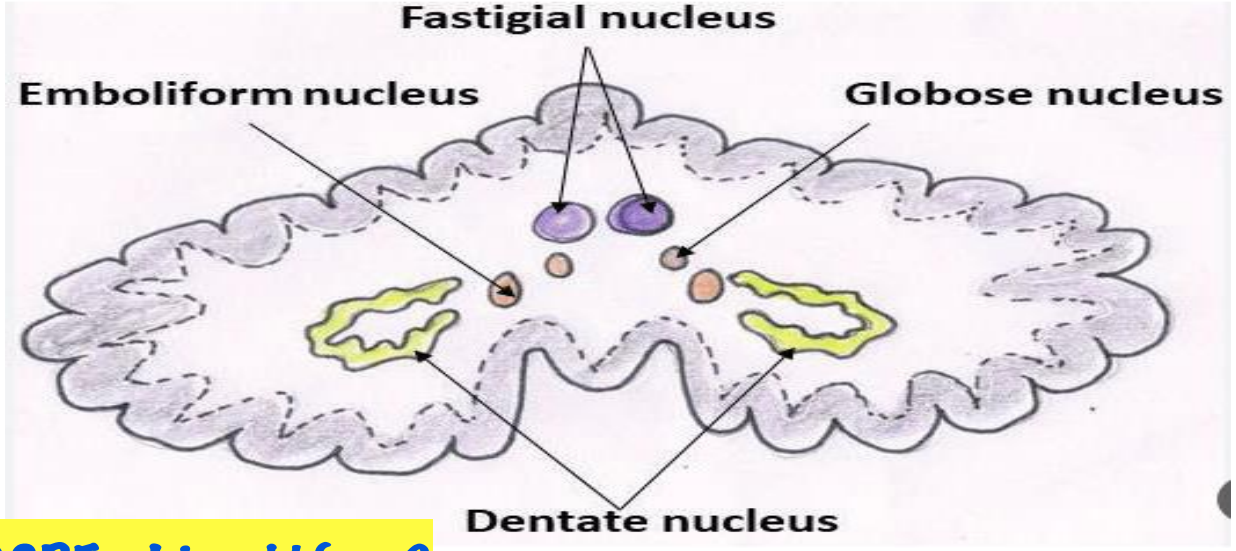
OSPE : Identify ?

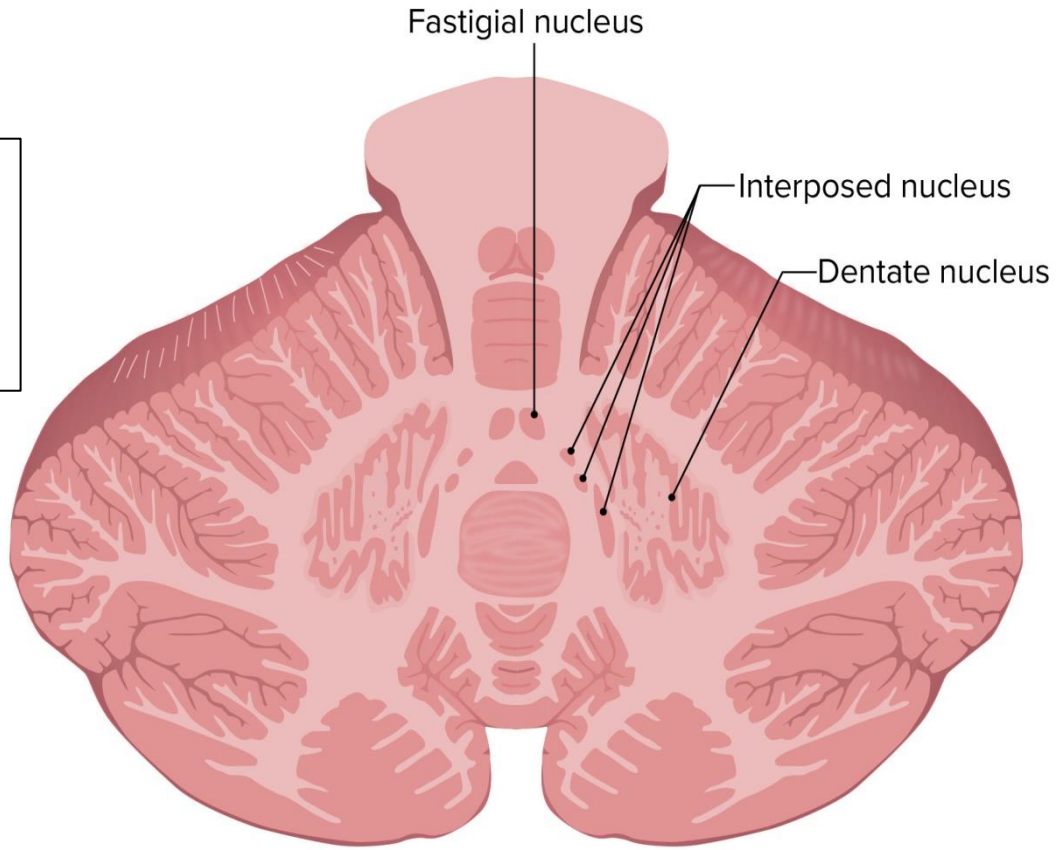
cerebellum

2) Deep cerebellar nuclei:

They are 4 in number, (From the medial to the lateral):

1. Fastigial nucleus
2. Globose nucleus
3. Emboliform nucleus
4. Dentate nucleus (the largest).

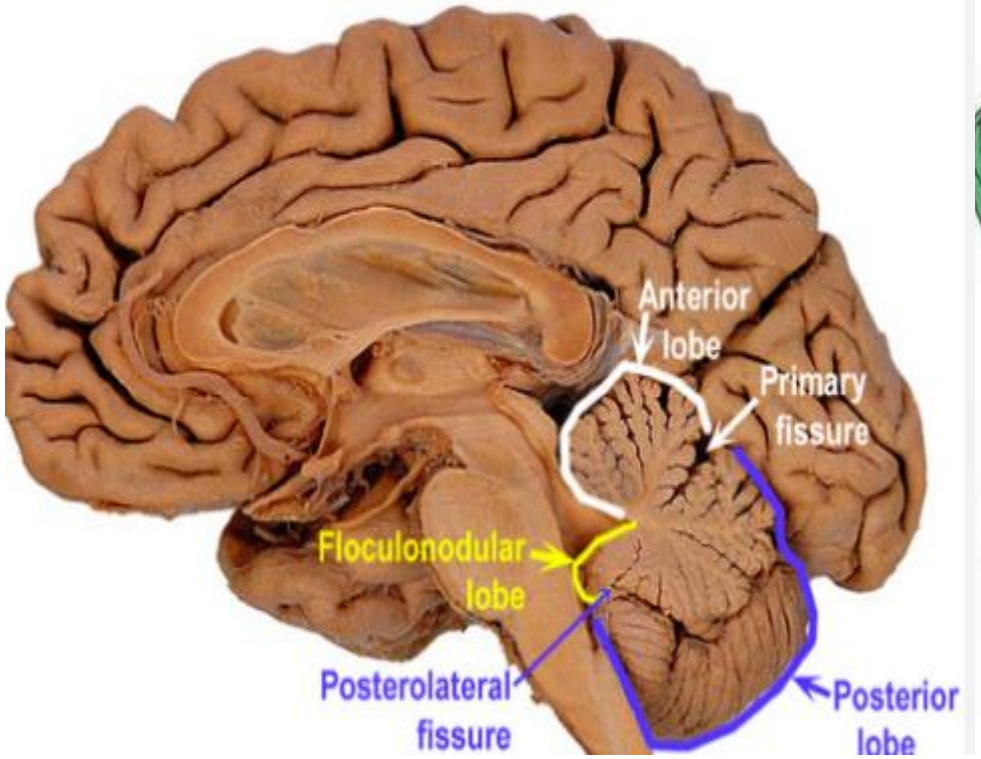




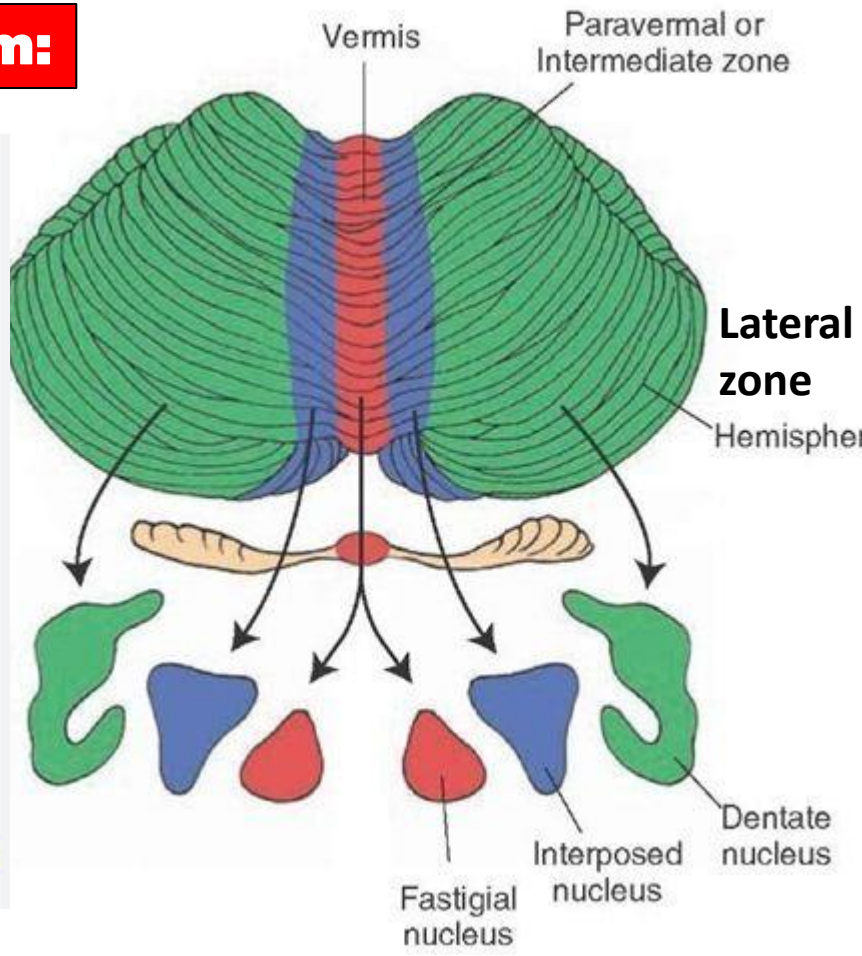
OSPE : Identify ?

cerebellum

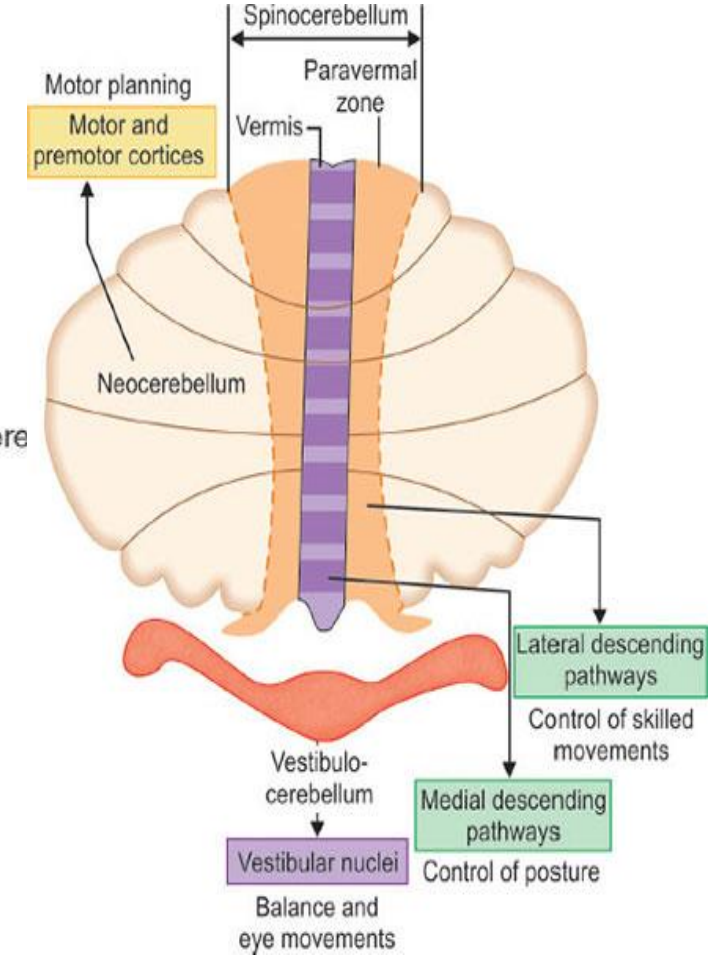
3) Divisions of the cerebellum:



A) Anatomical divisions



B) Longitudinal divisions



C) Functional divisions

cerebellum

3) Divisions of the cerebellum:

A) Anatomical divisions

- **The cerebellum is divided by the primary fissure and the posterolateral fissure into:**

- **Anterior lobe:** lies cranial to the primary fissure.
- **Posterior lobe:** lies between the primary fissure and the posterolateral fissure.
- **Flocculonodular lobe:** is formed of the nodule and the two flocculi.

B) Longitudinal divisions

- **According to the connections of the deep cerebellar nuclei:**

- **Vermal zone:** the cerebellar cortex projects to the fastigial nucleus.
- **Paravermal zone:** the cerebellar cortex projects to the interposed nuclei.
- **Lateral zone:** the cerebellar cortex projects to the dentate nucleus.

C) Functional divisions

- **3 functional zones:**

- **Archicerebellum (vestibulocerebellum):** Consists of the flocculonodular lobe.
- **Paleocerebellum (spinocerebellum):** Consists of the vermal & paravermal zones of the anterior and posterior lobes.
- **Neocerebellum (cerebrocerebellum):** Consists of the lateral zone of the cerebellar hemisphere.

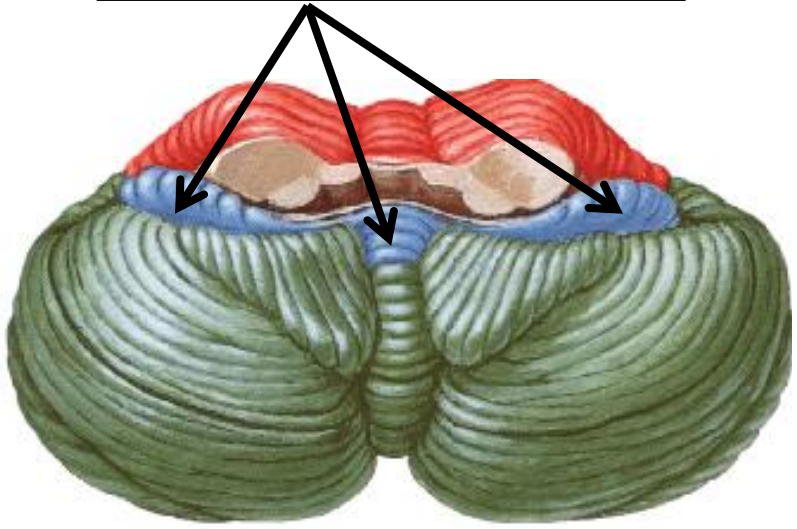
cerebellum

3) Divisions of the cerebellum:

Functional divisions

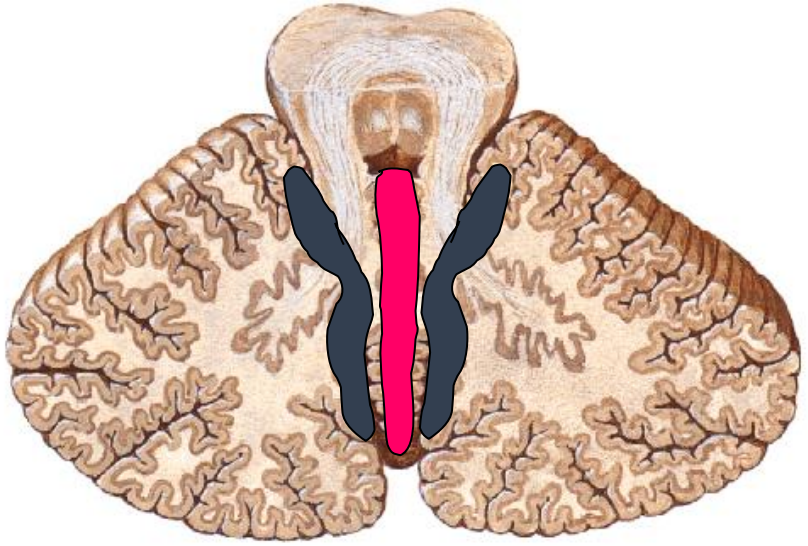
1) Archicerebellum (vestibulocerebellum):

- It Consists of the **flocculonodular lobe**



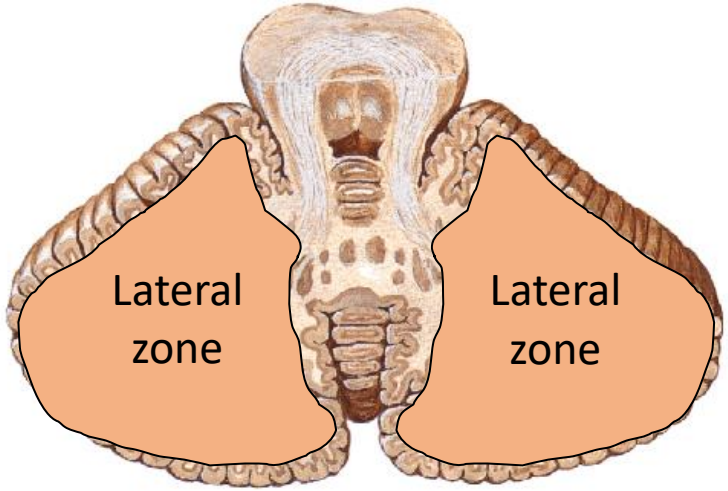
2) Paleocerebellum (spinocerebellum):

- It Consists of the **vermal & paravermal zones**



3) Neocerebellum (cerebrocerebellum):

- It Consists of the **lateral zone** of the cerebellar hemisphere



OSPE : Identify this functional devision & Mention it's function ?

cerebellum

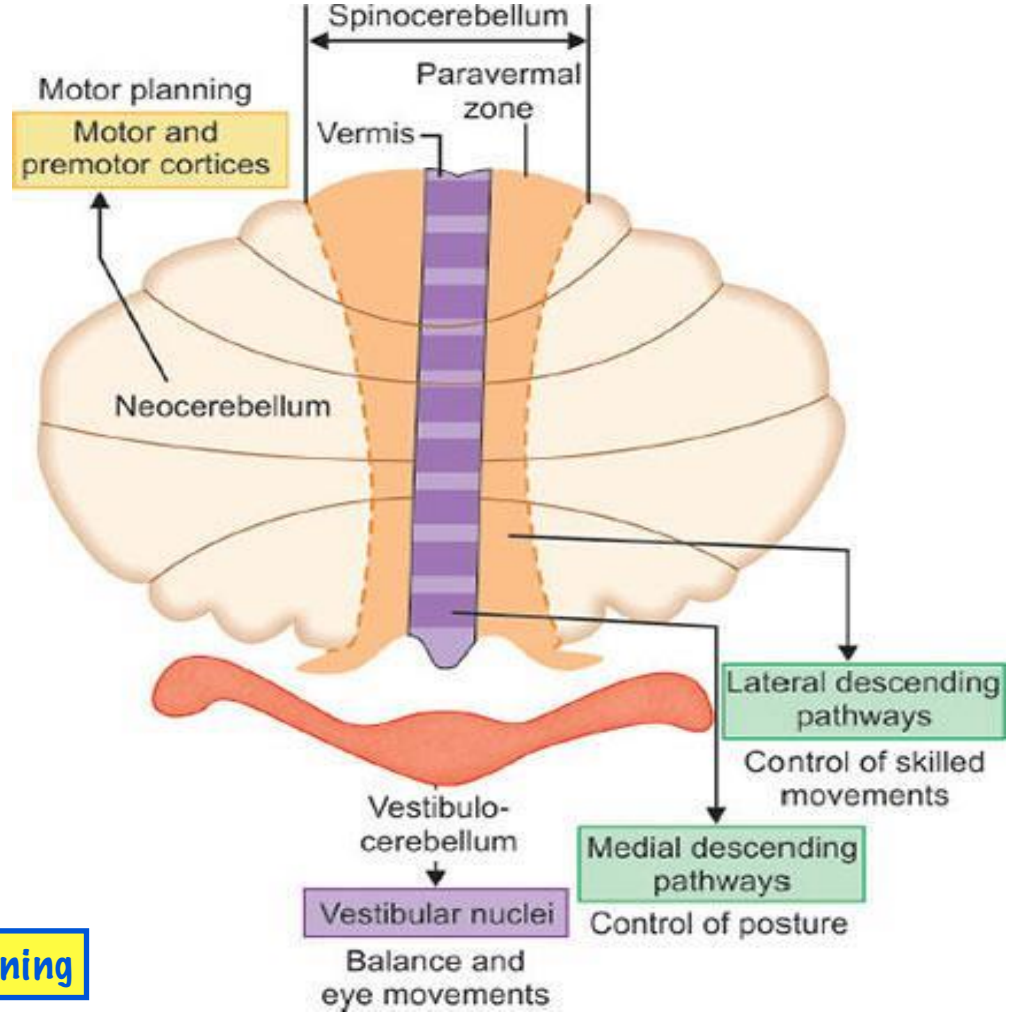
3) Divisions of the cerebellum:

Functional divisions

a. **Archicerebellum (vestibulocerebellum):**
   - It Consists of the flocculonodular lobe.
   - It is connected with the vestibular system
   - It is concerned with **equilibrium**.

b. **Paleocerebellum (spinocerebellum):**
   - It Consists of the vermal & paravermal zones of the anterior and posterior lobes.
   - It is Connected with spinal cord.
   - It is Concerned with regulation of muscle tone and muscle coordination.

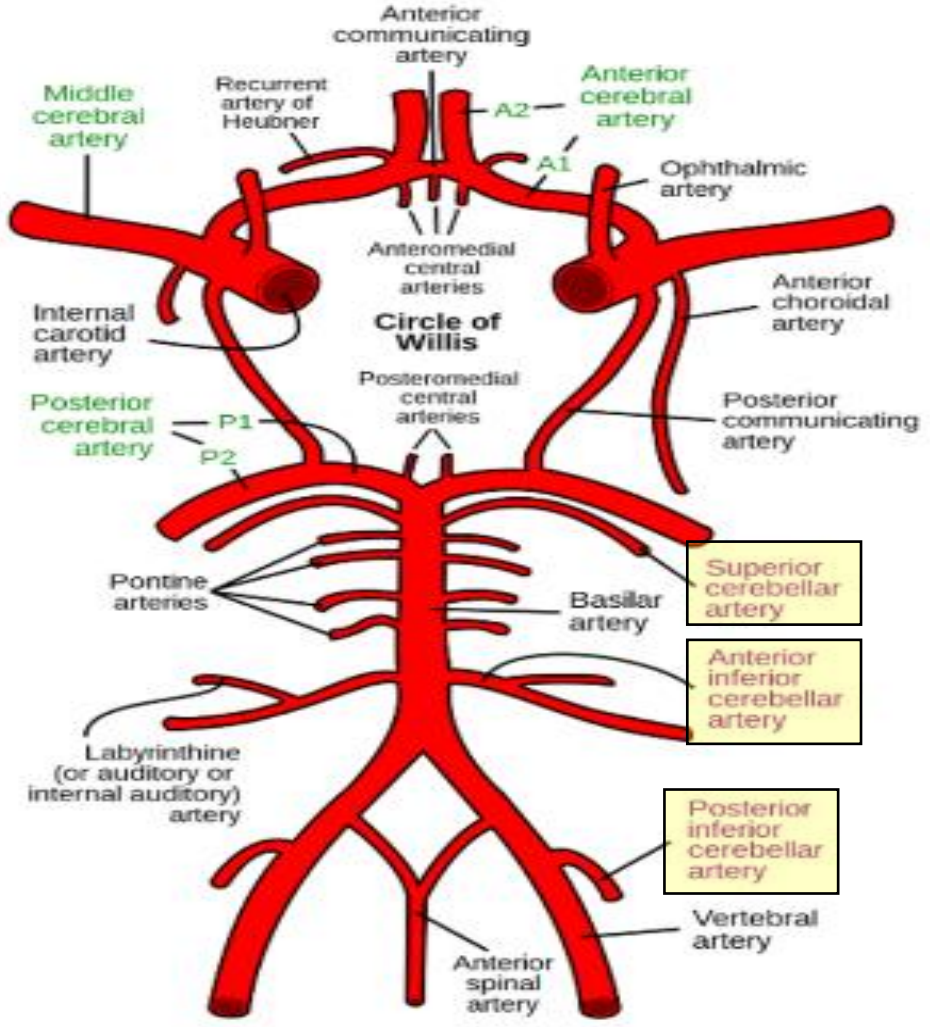
c. **Neocerebellum (cerebrocerebellum):**
   - It Consists of the lateral zone of the cerebellar hemisphere.
   - It is Connected with the cerebral cortex.
   - It is Concerned with automatic control of movement. ← + Planning



cerebellum

4) Arterial supply of the cerebellum

1) **Superior cerebellar artery (SCA):**
   - **Branch** of the basilar artery.
   - **It supplies** the superior surface of the cerebellum and the superior cerebellar peduncle.
2) **Anterior inferior cerebellar artery (Aica):**
   - **Branch** of the basilar artery.
   - **It supplies** the anterior part of the inferior surface and the middle cerebellar peduncle.
3) **Posterior inferior cerebellar artery (Pica):**
   - **Branch** of the vertebral artery.
   - **It supplies** the posterior part of the inferior surface and the inferior cerebellar peduncle



cerebellum

1) Gross features
   - A) Cerebellar peduncles
   - B) The vermis
   - C) notches
   - D) Fissures
2) Deep cerebellar nuclei
3) Divisions of the cerebellum
   - A) Anatomical divisions
   - B) Longitudinal divisions
   - C) Functional divisions
4) Arterial supply of the cerebellum

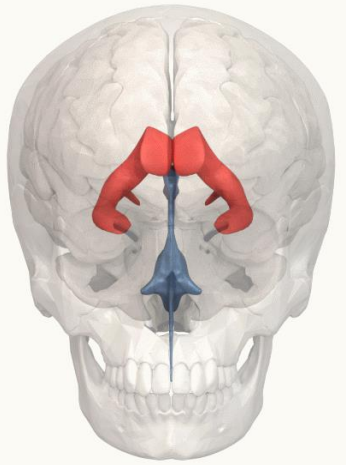
Quiz

The middle cerebellar peduncle is supplied by ?

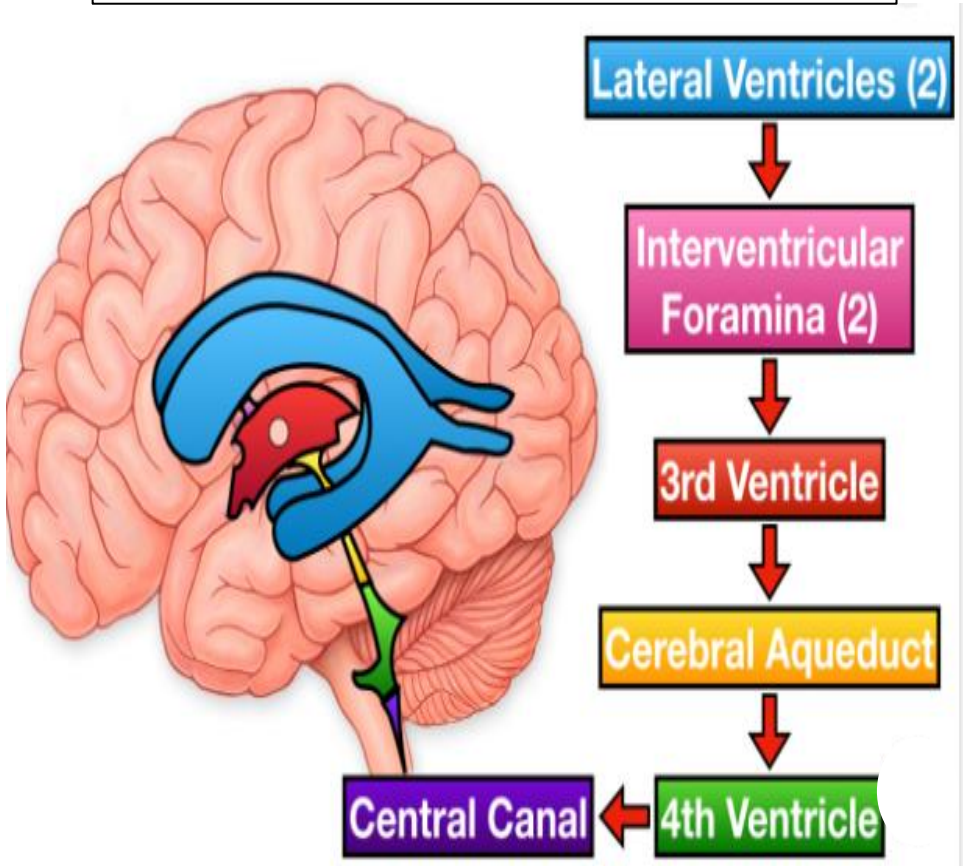
A. Superior cerebellar artery .
B. Anterior inferior cerebellar artery.
C. Posterior inferior cerebellar artery .
D. Middle cerebral artery.
E. Anterior cerebral artery.

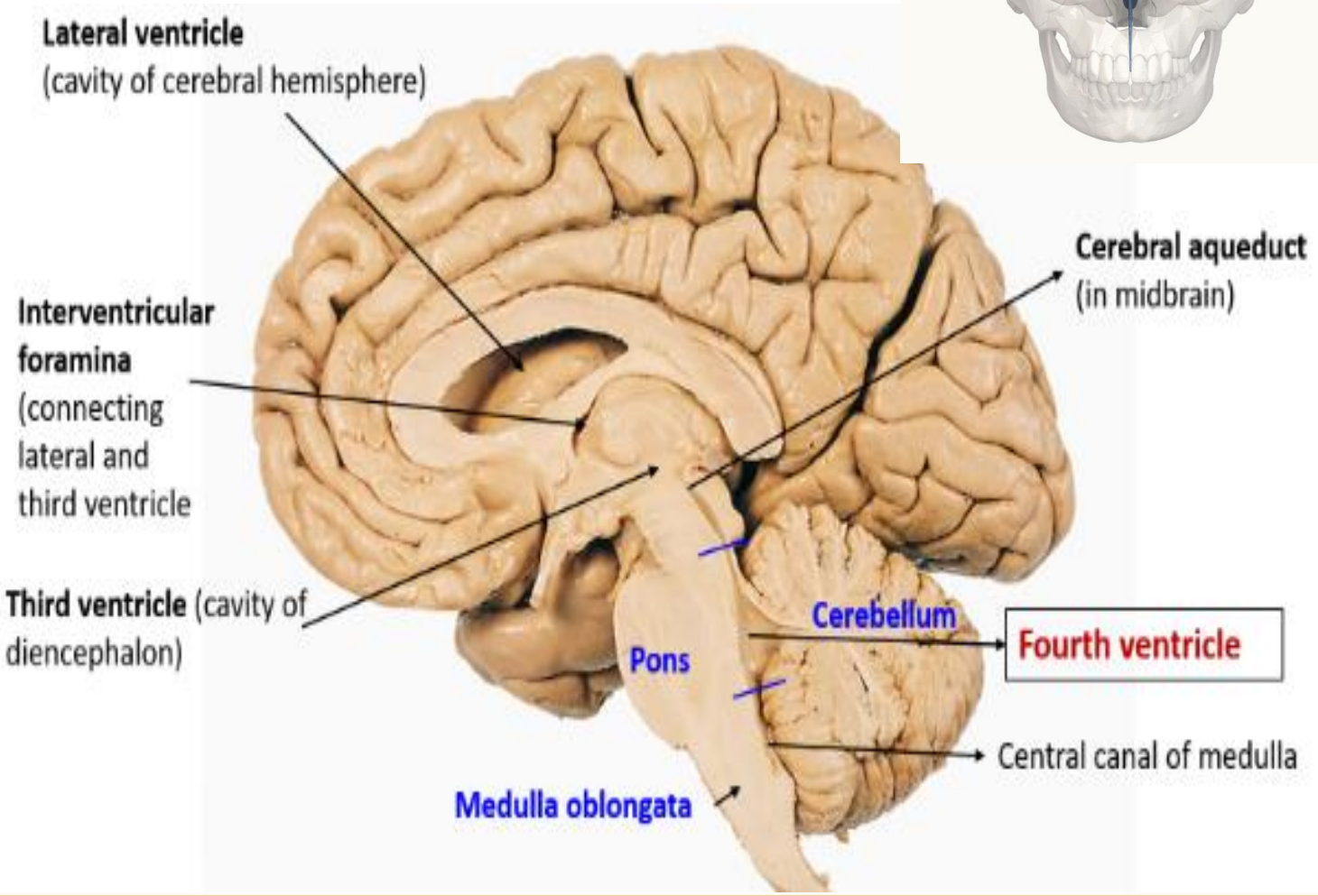
The answer is B

4th ventricle



- **Definition:** it is the cavity of the hindbrain (rhombencephalon)

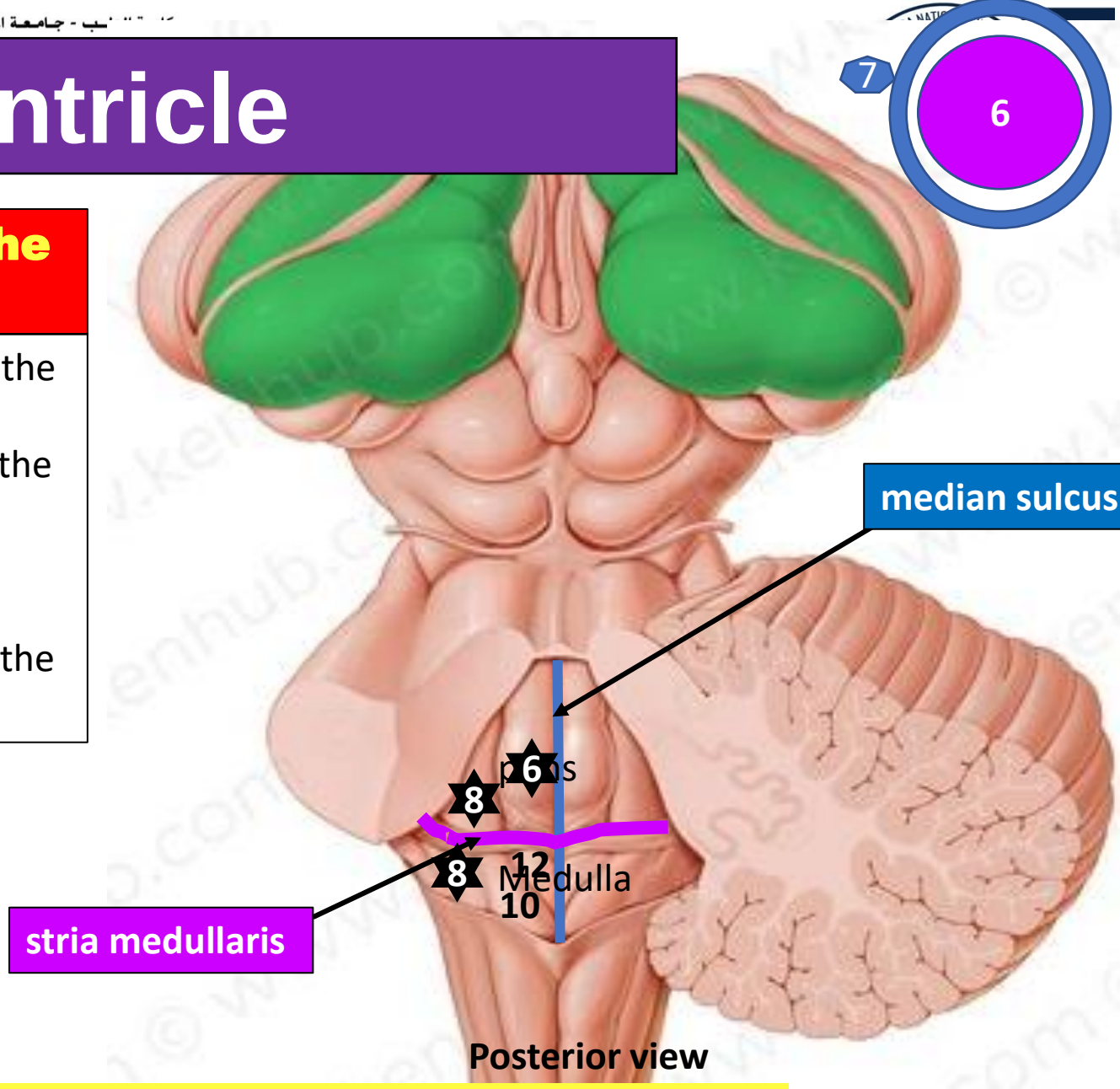




4th ventricle

1) Cranial nerve nuclei in the floor of the 4th ventricle:

- **Abducent nucleus:** opposite the facial colliculus in the pons.
- **Vestibular nuclei:** in the vestibular trigone in both the pons and medulla.
- **Dorsal motor nucleus of the vagus:** in the vagal trigone in the medulla.
- **Hypoglossal nucleus:** in the hypoglossal trigone in the medulla.

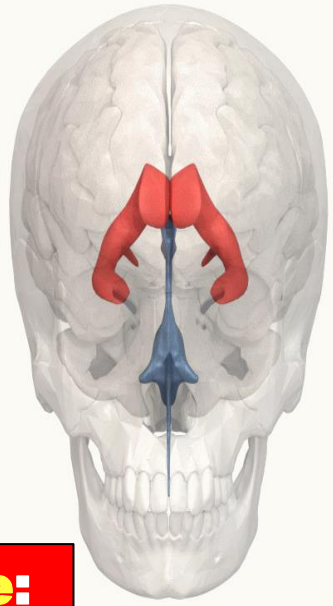


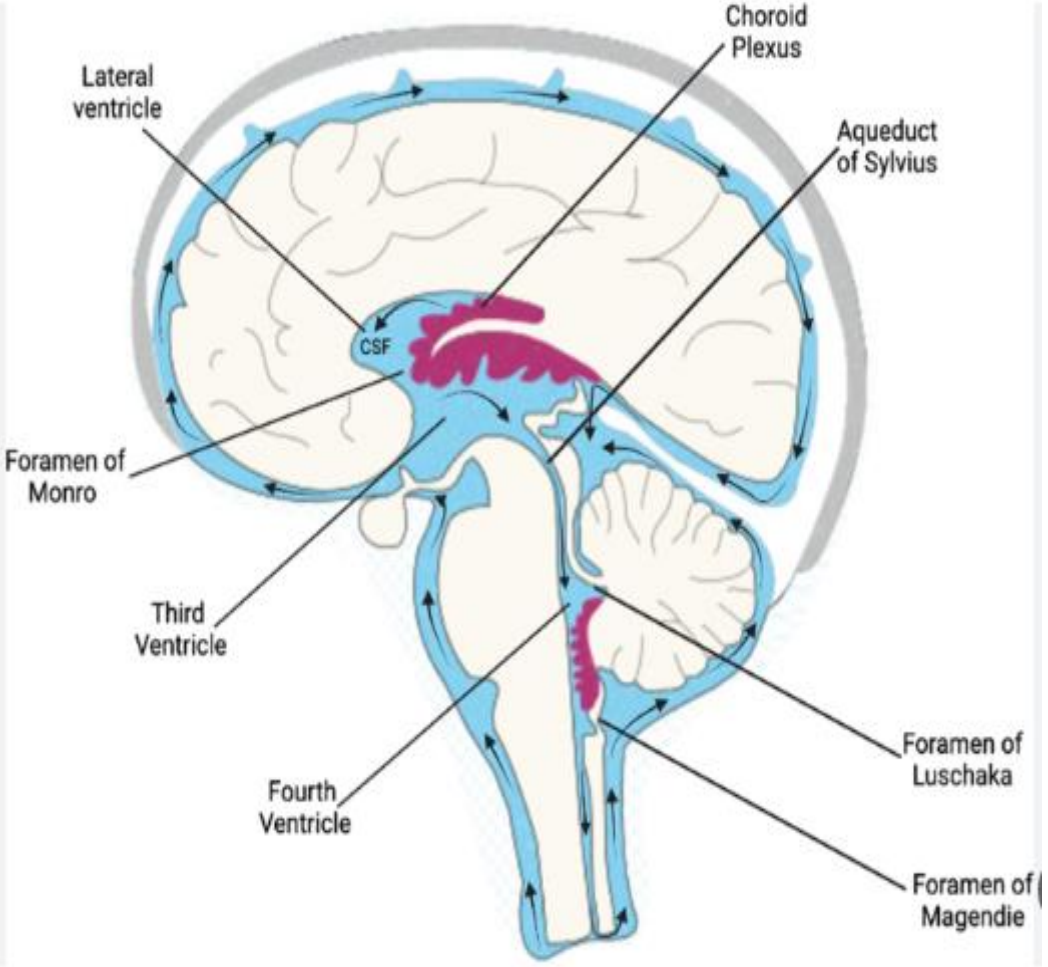
OSPE : Enumerate Cranial nerve nuclei in the floor of the 4th ventricle?

4th ventricle

2) foramina of 4th ventricle:

1. **Median aperture (foramen of Magendie):** present in the inferior medullary velum.
2. **Two lateral apertures (foramina of Luschka):** in the lateral recess at the cerebellopontine angle.



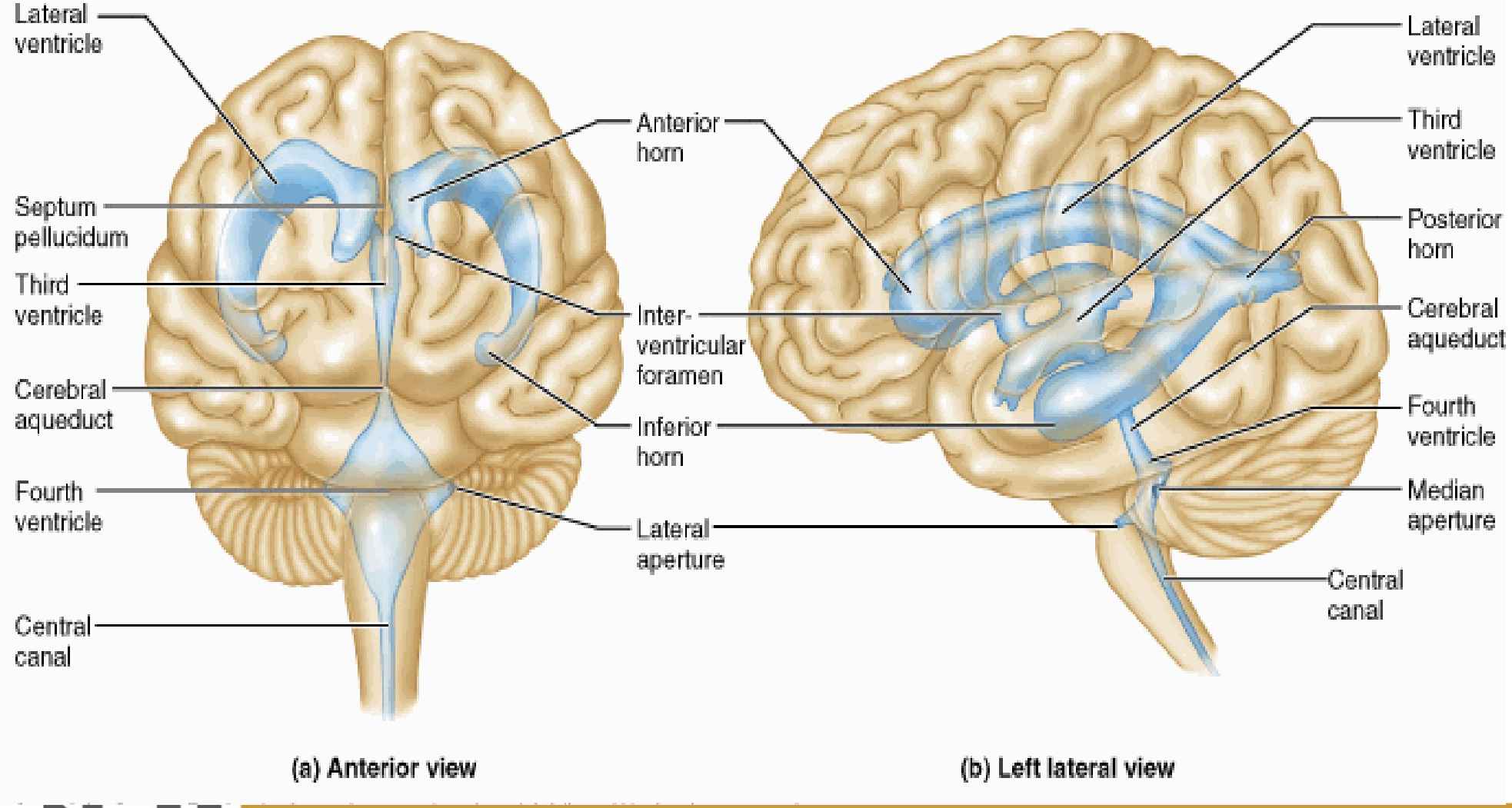


3) Communications of 4th ventricle:

- **With the 3rd ventricle** through the cerebral aqueduct of Sylvius.
- **With the central canal** of the medulla and spinal cord. ← By obex
- **With the subarachnoid space** through foramen of Magendie & foramina of Luschka.

N.B : Centeral canal ends as spinal cord

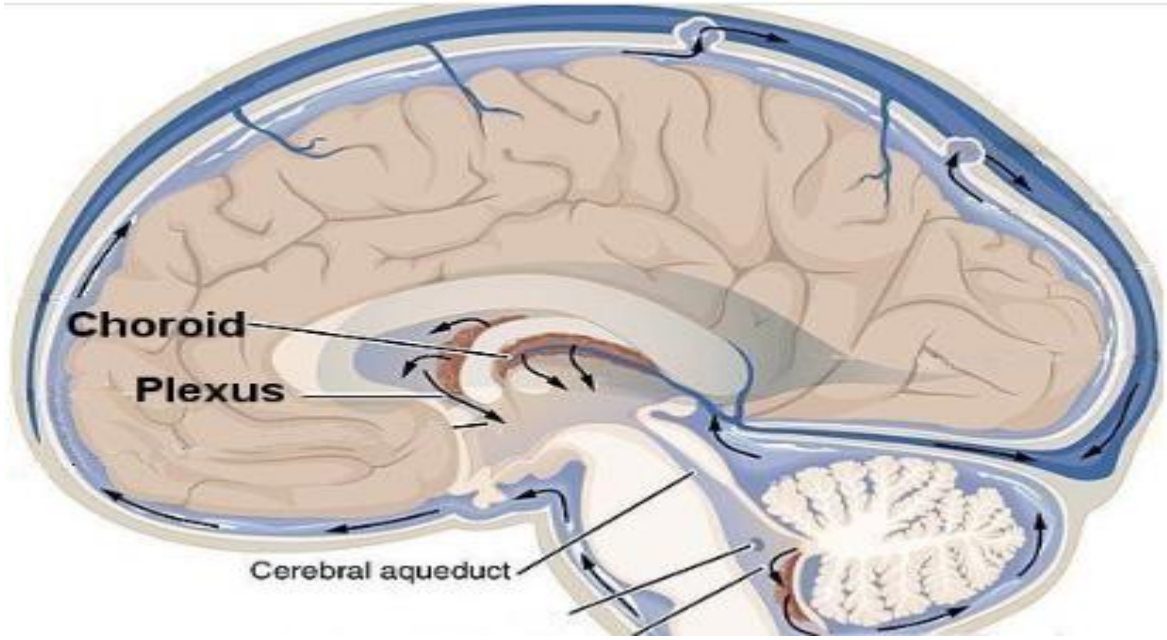
4th ventricle

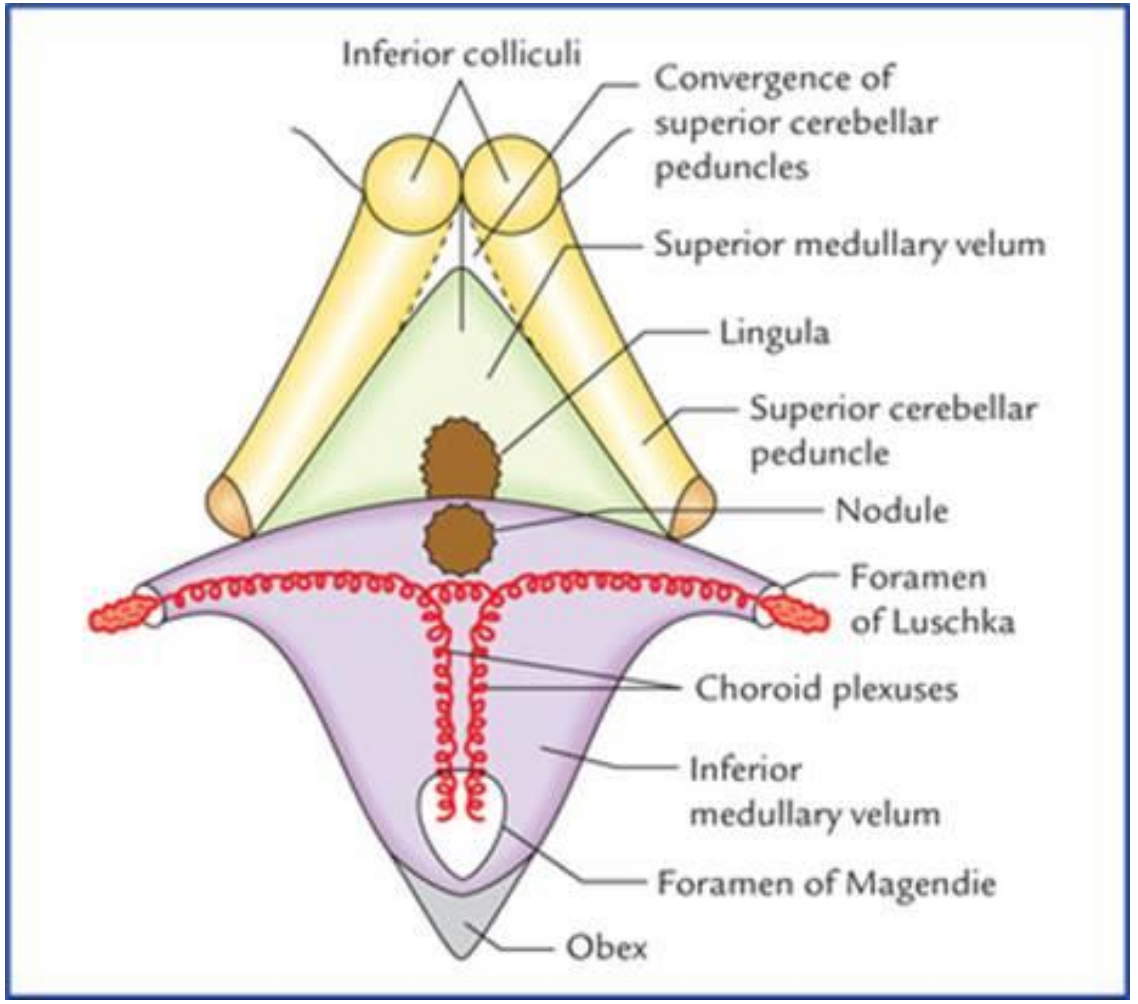


4th ventricle

4) Choroid plexus:

- It has a T-shaped plexus.
- It has a stem and 2 lateral arms. Each arm extends laterally into the lateral recess and is supplied by the **PICA.**





OSPE مهم : Choroid plexus of 4th ventricle supplied by ?

Quiz

The choroid plexus of 4th ventricle is supplied by ?

A. Superior cerebellar artery .
B. Anterior inferior cerebellar artery.
C. Posterior inferior cerebellar artery .
D. Middle cerebral artery.
E. Anterior cerebral artery.

The answer is C

WITH NOTES

Anatomy of diencephalon & 3rd ventricle

Dr Dina Hany

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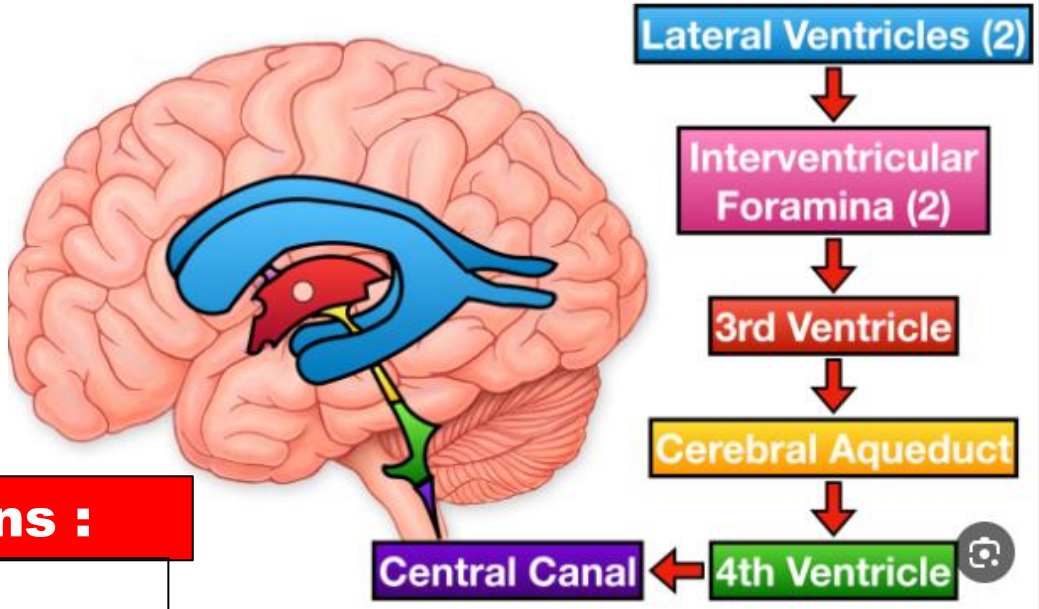
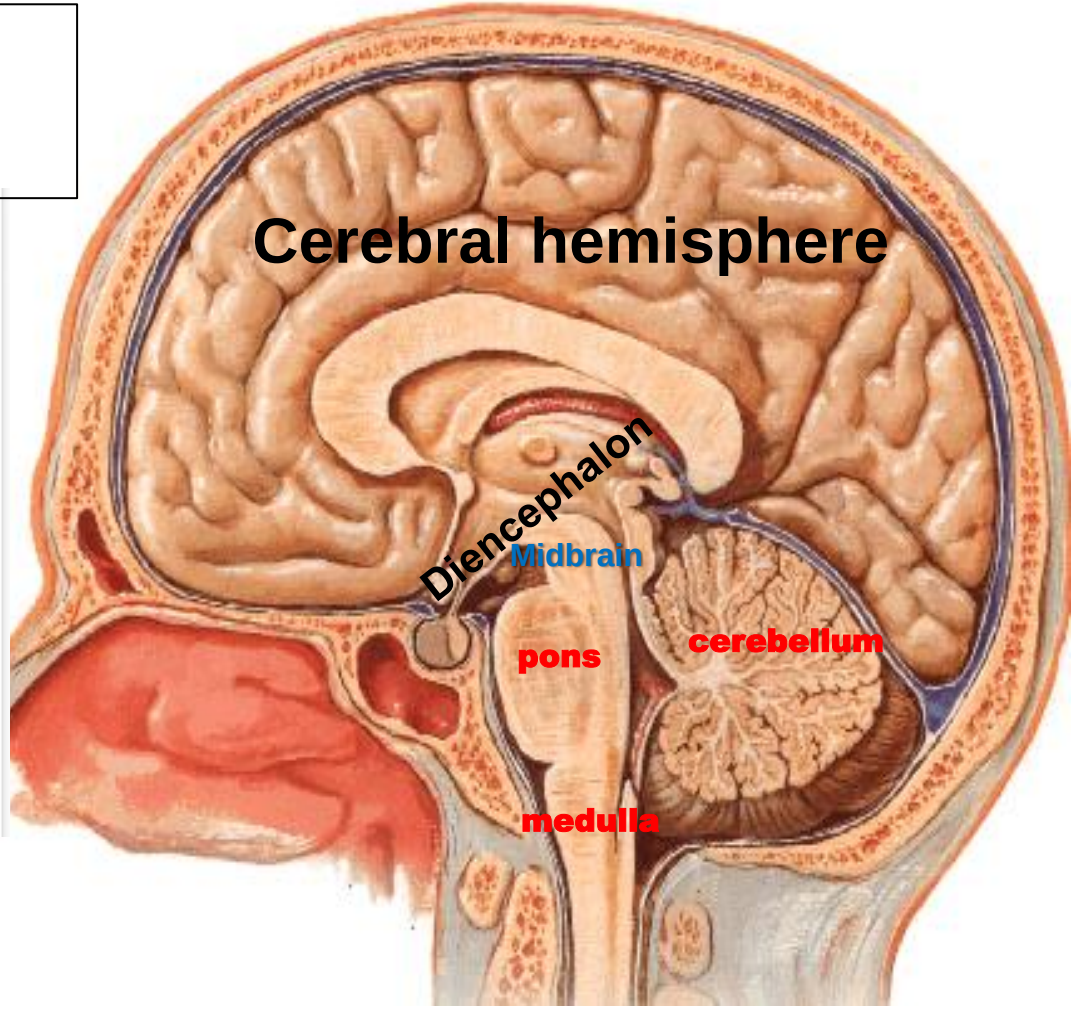
diencephalon

- The diencephalon is located between the midbrain and the cerebral hemisphere.
- It has a single midline **cavity** called the **third ventricle**.





divisions :

1. Thalamus
2. Hypothalamus
3. Epithalamus
4. Subthalamus

OSPE : Enumerate content of epithalamus ?

diencephalon

Superiorly:

- 1) Tela choroidae of the 3rd ventricle
  - 4 layers: ① Ependymal ② Pial (extra) ③ Vascular ④ Pial
- 2) Body of the fornix
- 3) Lateral ventricle

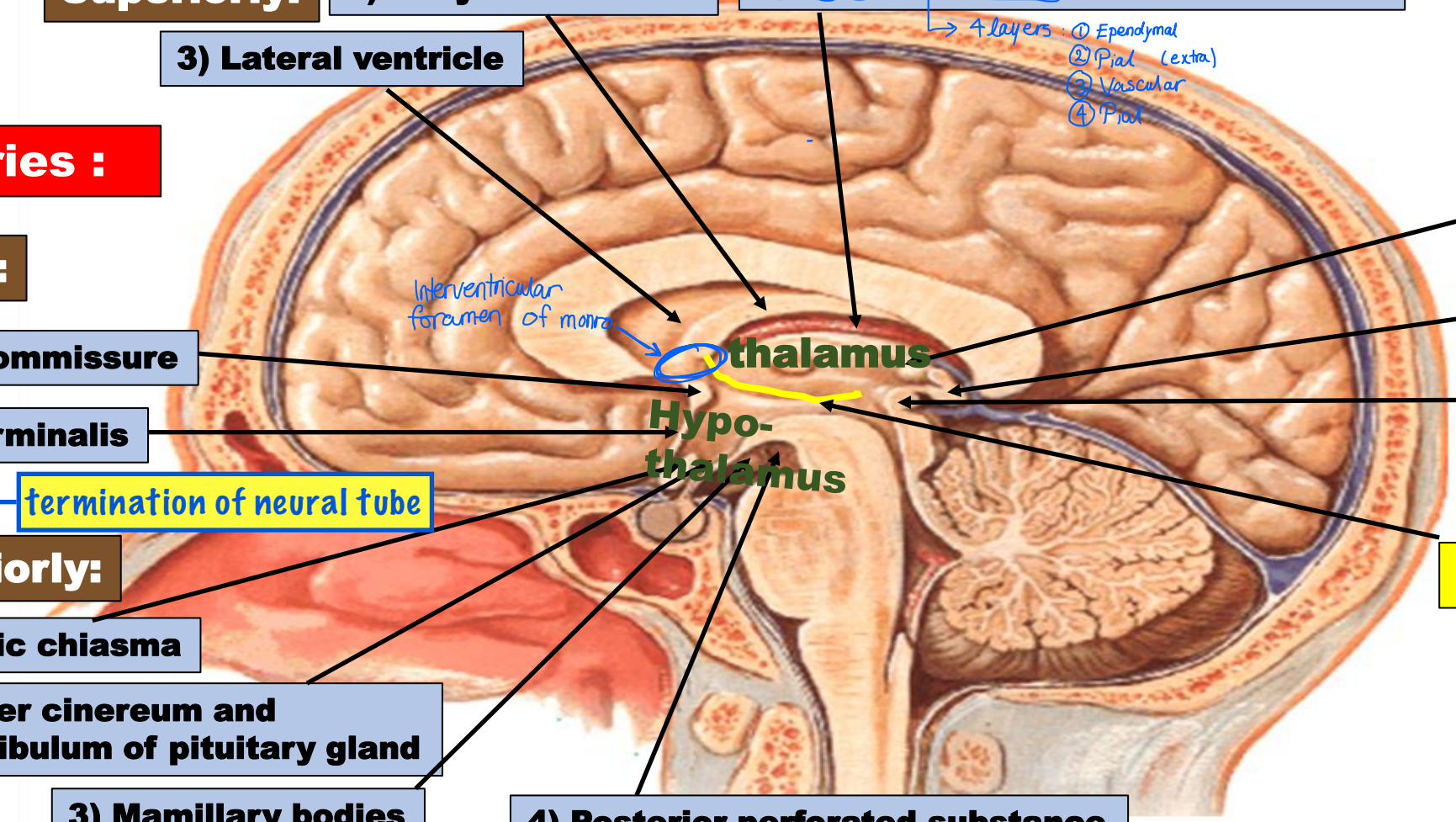
Posteriorly: called Epithalamus

- 1) Habenular trigone
- 2) Pineal gland
- 3) Posterior commissure

Boundaries :

Anteriorly:

- 1) Anterior commissure
- 2) Lamina terminalis
  - termination of neural tube



Inferiorly:

- 1) Optic chiasma
- 2) Tuber cinereum and Infundibulum of pituitary gland
- 3) Mamillary bodies
- 4) Posterior perforated substance

hypothalamic sulcus

Sagittal section

N.B !!!! مهمة جدا : Pinealoma may affect posterior commissure → leads to Parinaud's syndrome (vertical gaze palsy)

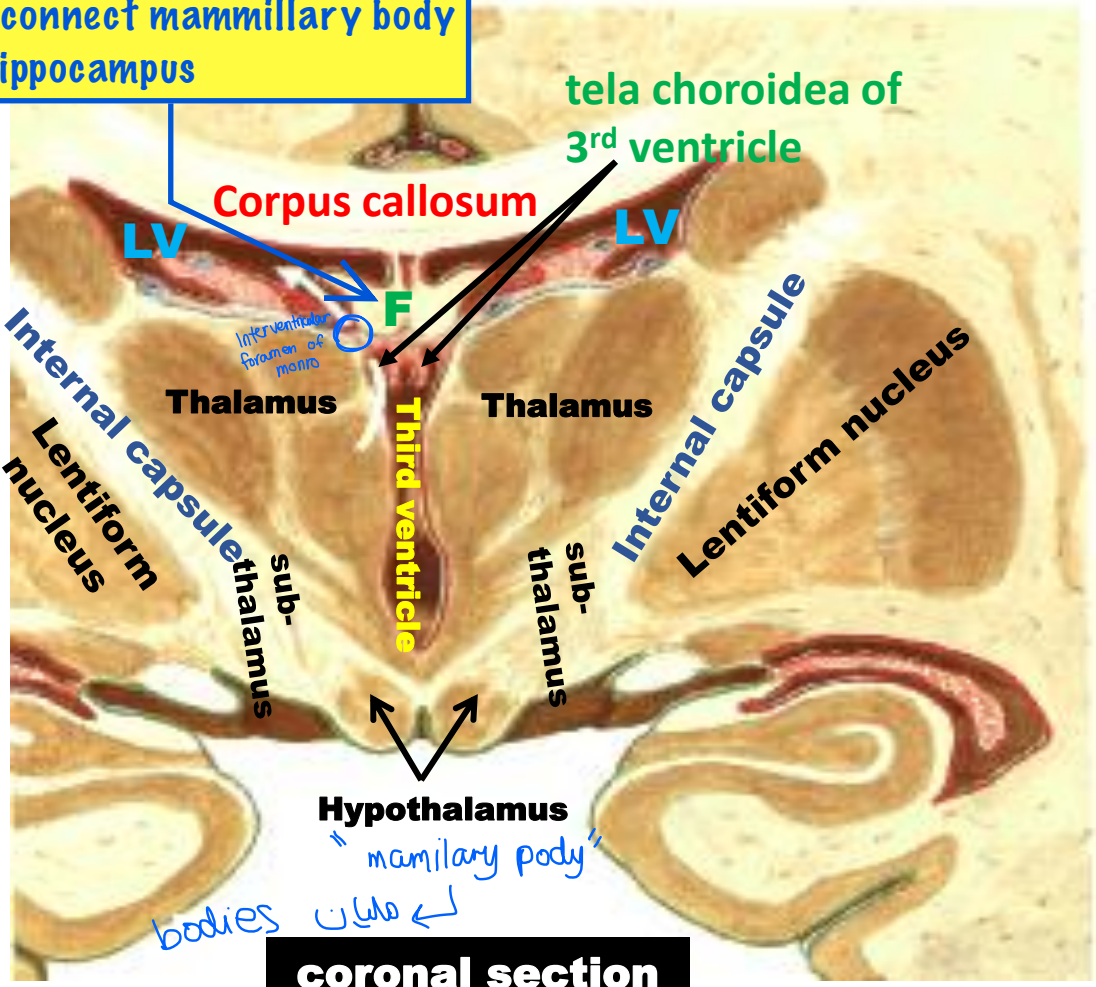
diencephalon

Boundaries :

Anteriorly: lamina terminalis and anterior commissure.
Posteriorly: posterior commissure, pineal gland and habenular trigone.
Superiorly: tela choroidea of the third ventricle, body of the fornix and lateral ventricle.
Inferiorly: optic chiasma, tuber cinereum & infundibulum, mamillary bodies and posterior perforated substance.
Medially: the 3rd ventricle.
Laterally: posterior limb of the internal capsule.

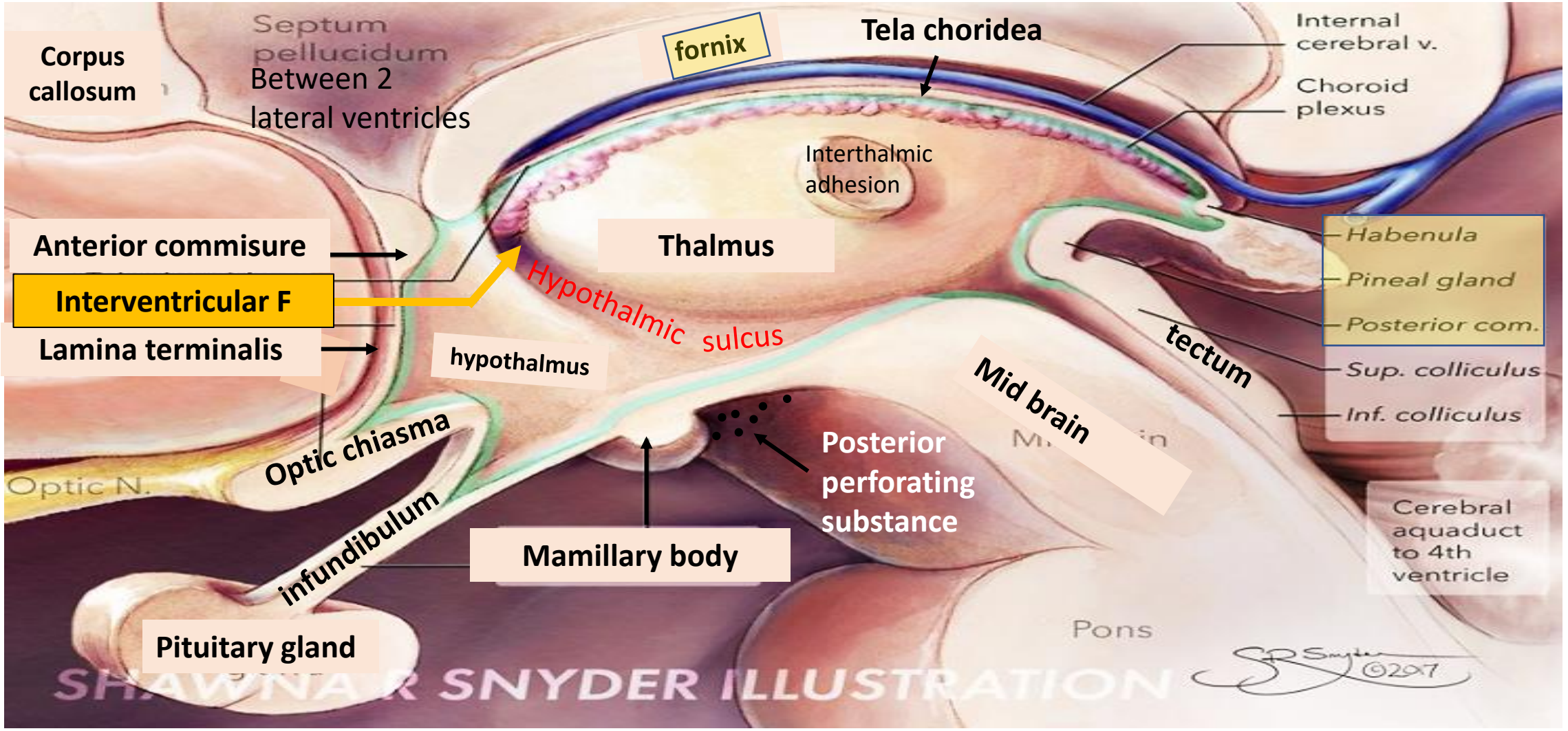
divisions :

1. Thalamus
2. Hypothalamus
3. Epithalamus
4. Subthalamus



OSPE !!!! مهم جدا : Lesion in subthalamus lead to : hemipallismus

diencephalon



diencephalon

A) The thalamus

is the largest part (four-fifth) of the diencephalon.
It receives all sensations except **olfaction** and projects them to sensory areas of the brain.

- The thalamus has **two ends and four surfaces:**

Anterior end: is related to the interventricular foramen.

Posterior end: called **pulvinar** and is related superiorly to the splenium of the corpus callosum and inferiorly to the tectum of the midbrain.

Superior surface: is related to the tela choroidea, fornix and lateral ventricle.

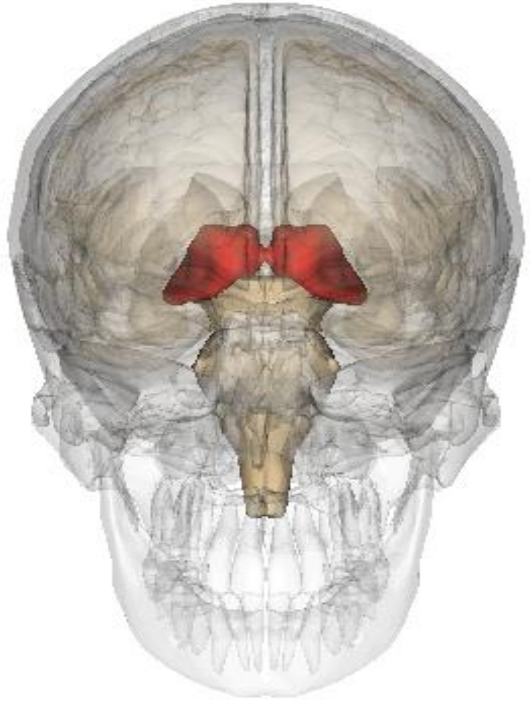
Inferior surface: is related to:

a) The hypothalamus and the subthalamus.

b) The **metathalamus** projects downward from the pulvinar and **It is formed of** the medial geniculate body & lateral geniculate body.

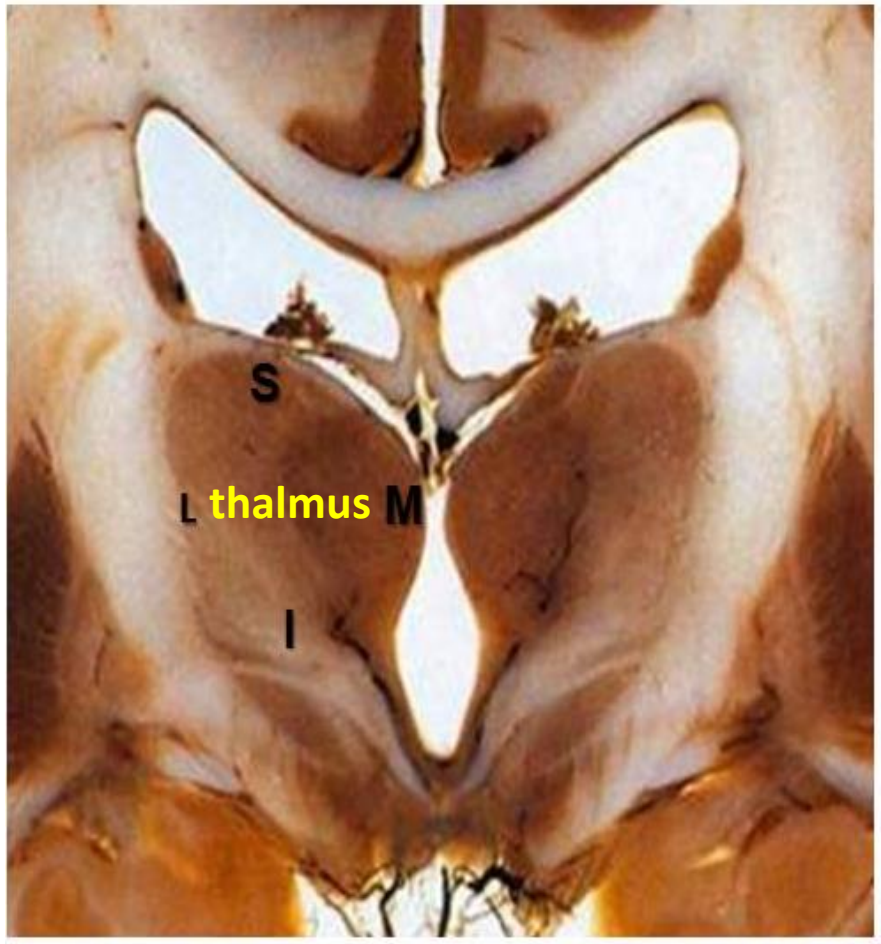
Medial surface: is related to the third ventricle. It is connected with the opposite one in 70% of humans by the interthalamic adhesion (massa intermedia).

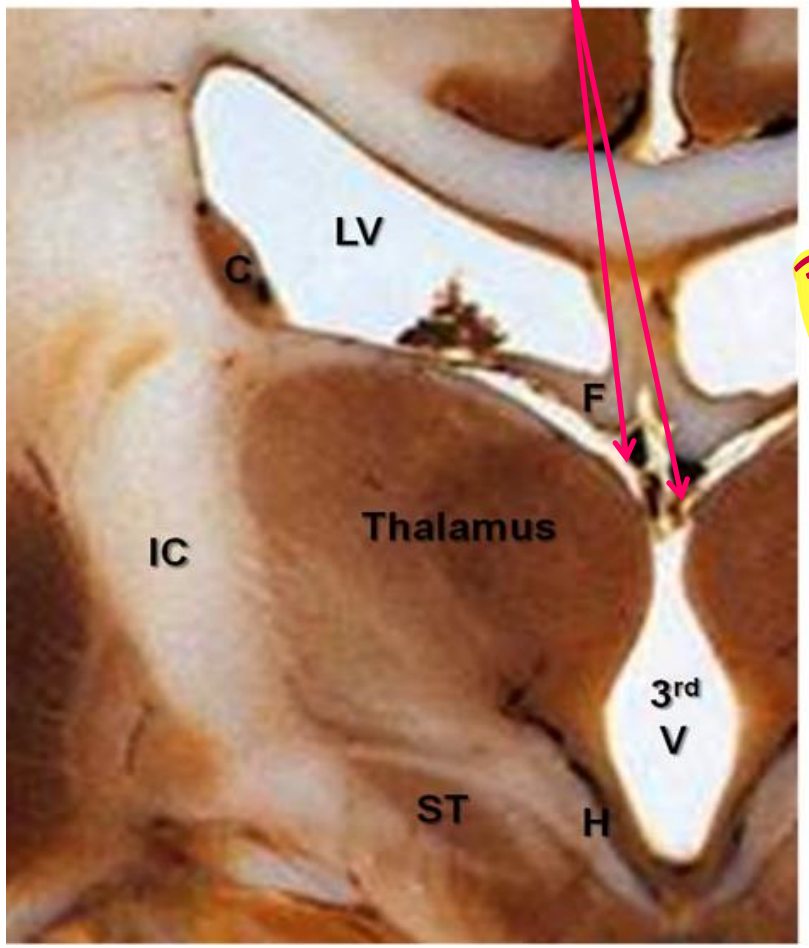
Lateral surface: is related to the posterior limb of the internal capsule.

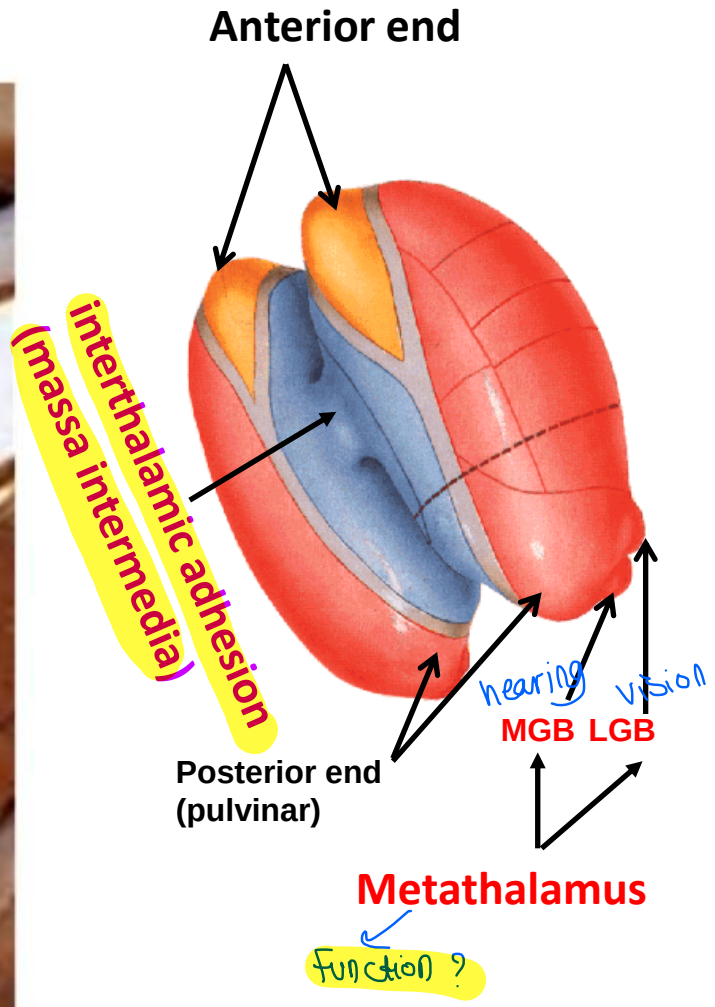


diencephalon

A) The thalamus



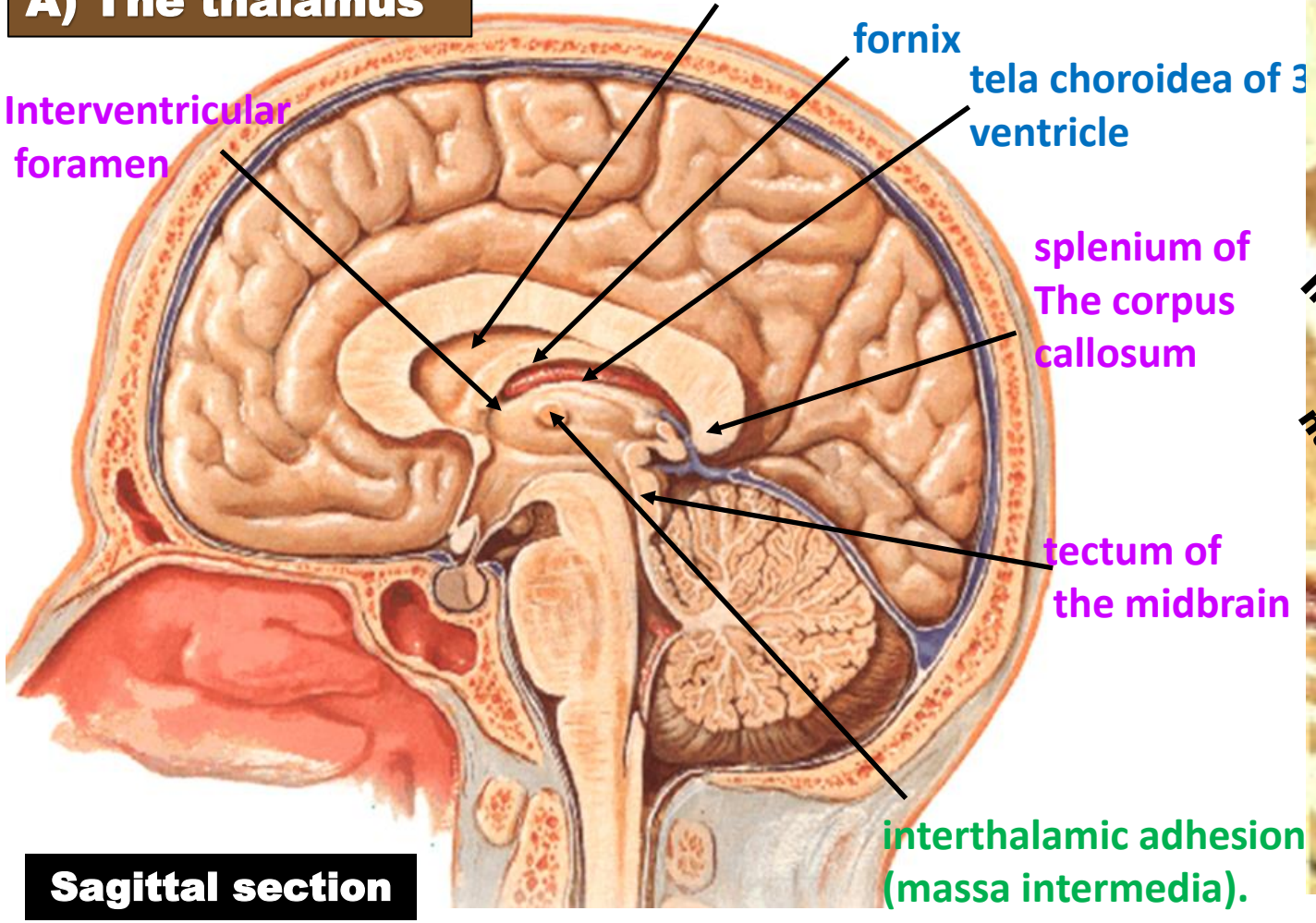




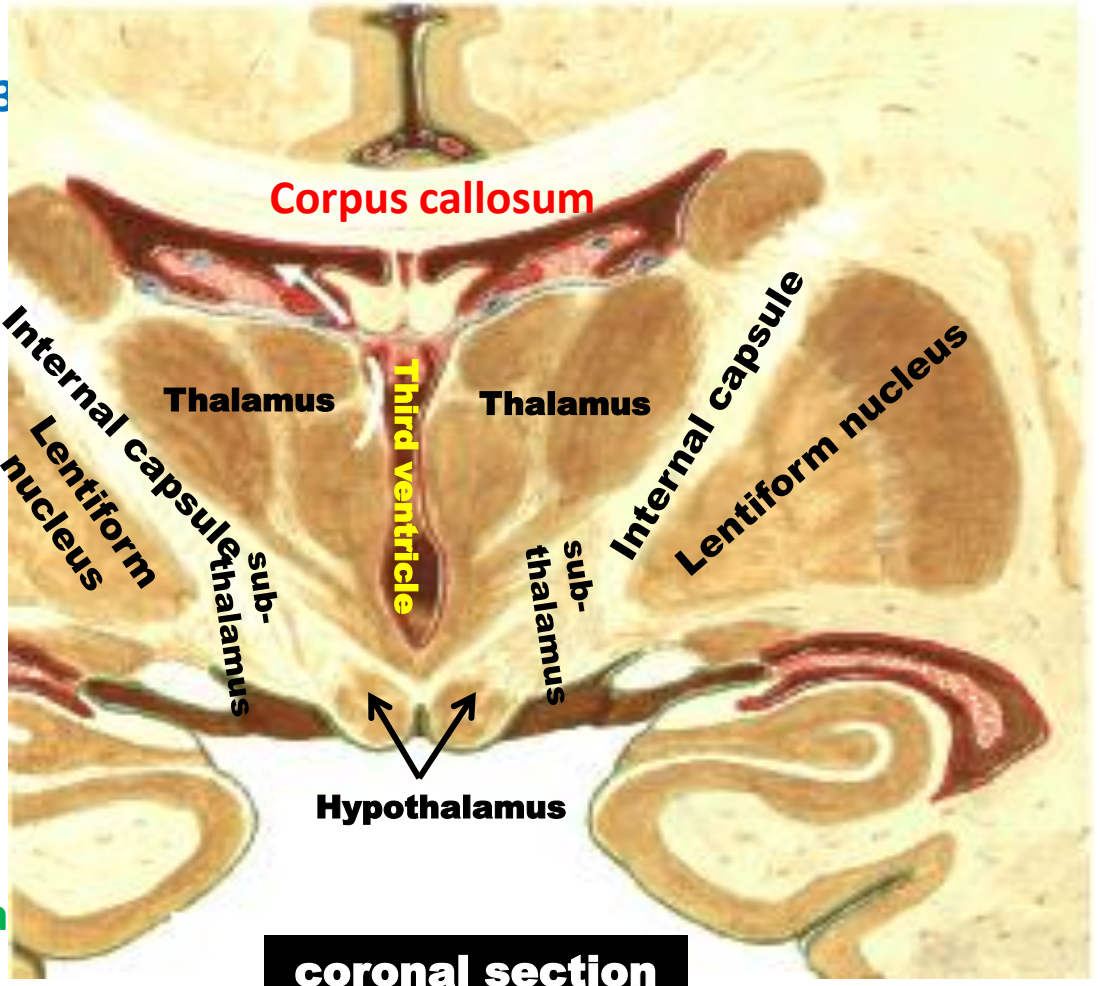
OSPE : Function of metathalamus ?

diencephalon

A) The thalamus



Sagittal section

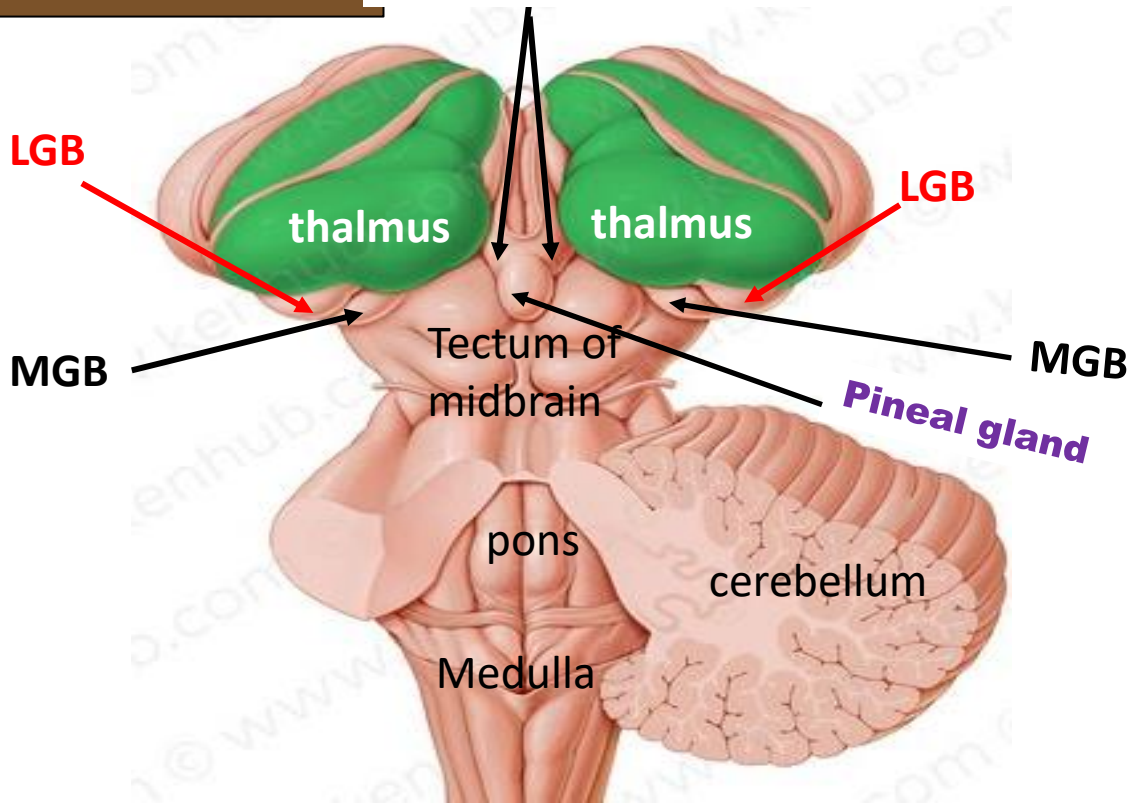


coronal section

diencephalon

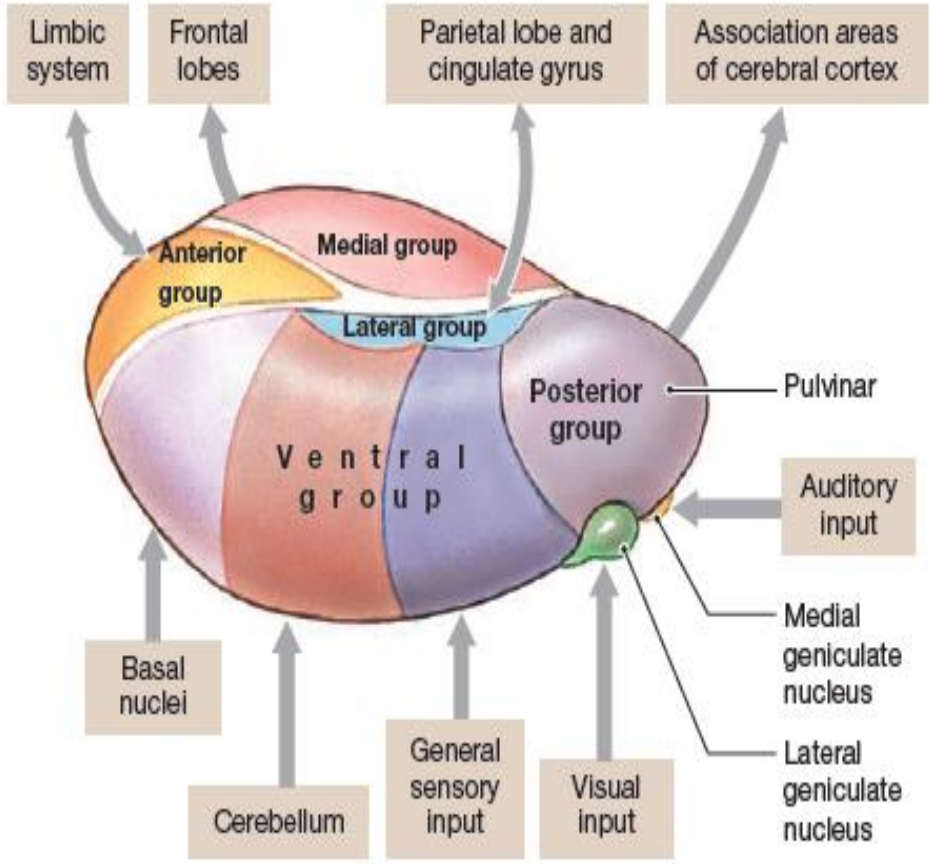
A) The thalamus

Habenular trigone



Posterior view

مش هنتسأل في الnuclei .. سكيب 😌

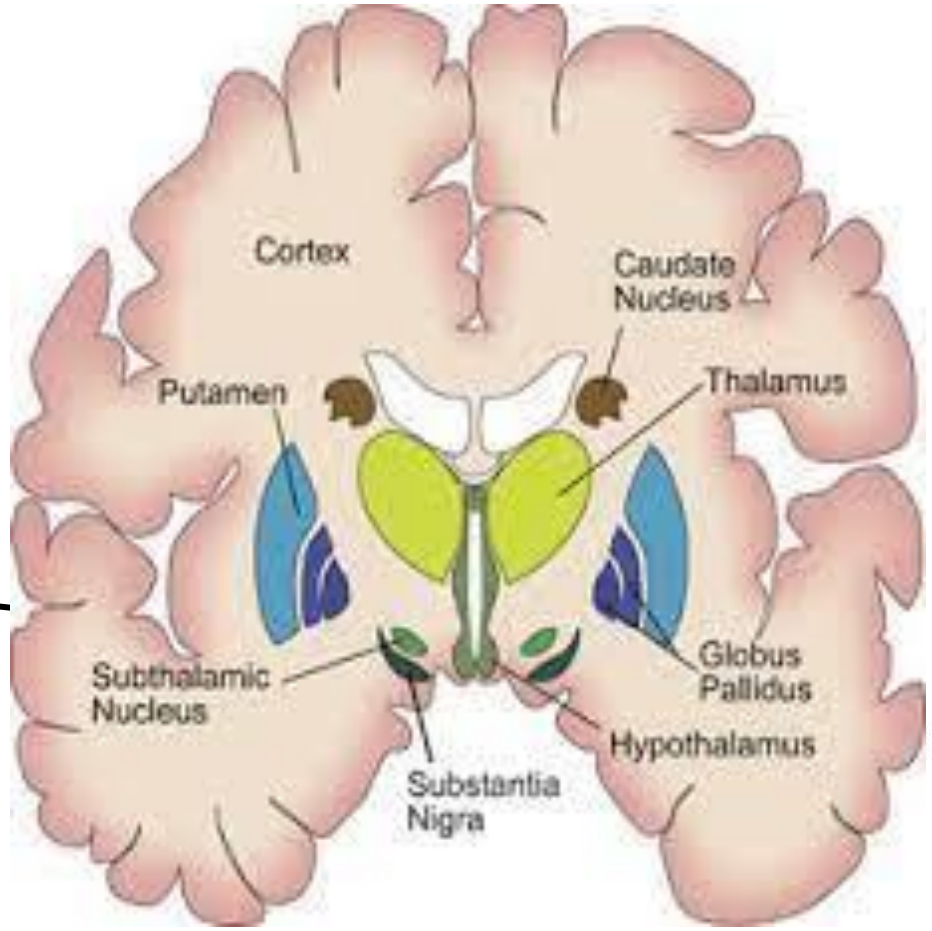


diencephalon

B) The hypo-thalamus

The hypothalamus is the principal autonomic and endocrine center

- **Related Anteriorly to** lamina terminalis and anterior commissure.
- **Related Superiorly to** the hypothalamic sulcus separating it from the thalamus.
- **Related Inferiorly to** the interpeduncular fossa.



C) The sub-thalamus

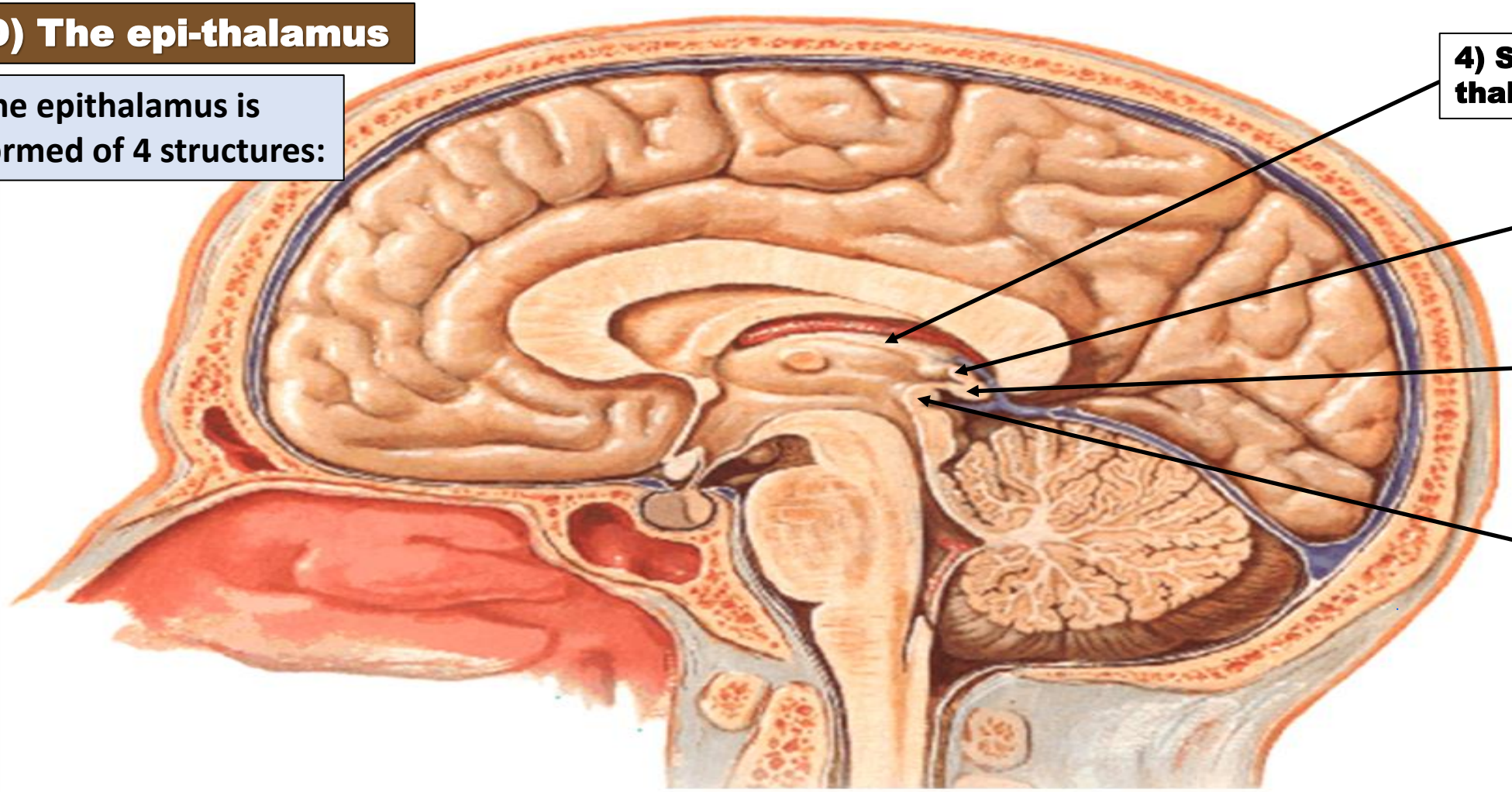
It contains subthalamic nucleus (motor nucleus) which regulates movement of muscles.
Lesion in the subthalamic nucleus causes **hemiballismus** (involuntary movement).

Site: it lies lateral to the hypothalamus between the thalamus and the midbrain.

diencephalon

D) The epi-thalamus

The epithalamus is formed of 4 structures:



4) Stria medullaris thalami:

3) Habenular trigone

2) Pineal gland

1) Posterior commissure

N.B : Stria medullaries & habenular trigone are part of Limbic system

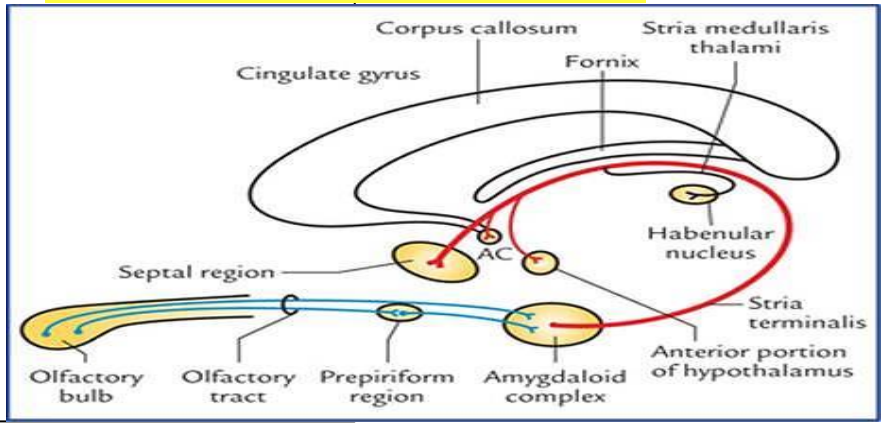
diencephalon

D) The epi-thalamus

The epithalamus is formed of 4 structures:

1. **Posterior commissure:** is a band of fibers connecting the following structures:
   - The two superior colliculi.
   - The pretectal nuclei with the Edinger-Westphal nuclei for bilateral light reflex.
   - The two oculomotor nuclei for the upward gaze (moving the two eyes upward).
2. **Pineal gland:**
   - It is an endocrine gland **located** above the posterior commissure.
   - It **doesn't** contain nerve cells. It contains cells called pinealocytes.
   - It **secretes melatonin** (hormone of darkness). It regulates the sleep-wake cycle.
3. **Habenular nucleus:**
   - It is lies above the pineal gland.
   - It is connected with the opposite one by the habenular commissure.
   - It is part of the limbic system, which is concerned with emotion & behavior.
4. **Stria medullaris thalami:**
   - It is a band of fibers connecting the septal area with the habenular nucleus.
   - It is part of the limbic system.

N.B مهمة جداااا : Pinealoma may affect posterior commissure → leads to Parinaud's syndrome (vertical gaze palsy)



diencephalon

Blood supply :

Thalmus

the main arterial supply is the posterior cerebral artery

- **Posterior cerebral artery:** from the basilar artery.
- **Posterior communicating artery:** from the internal carotid artery.
- **Anterior choroidal artery:** from the internal carotid artery to the lateral geniculate body

Hypo-thalmus

from circulus arteriosus

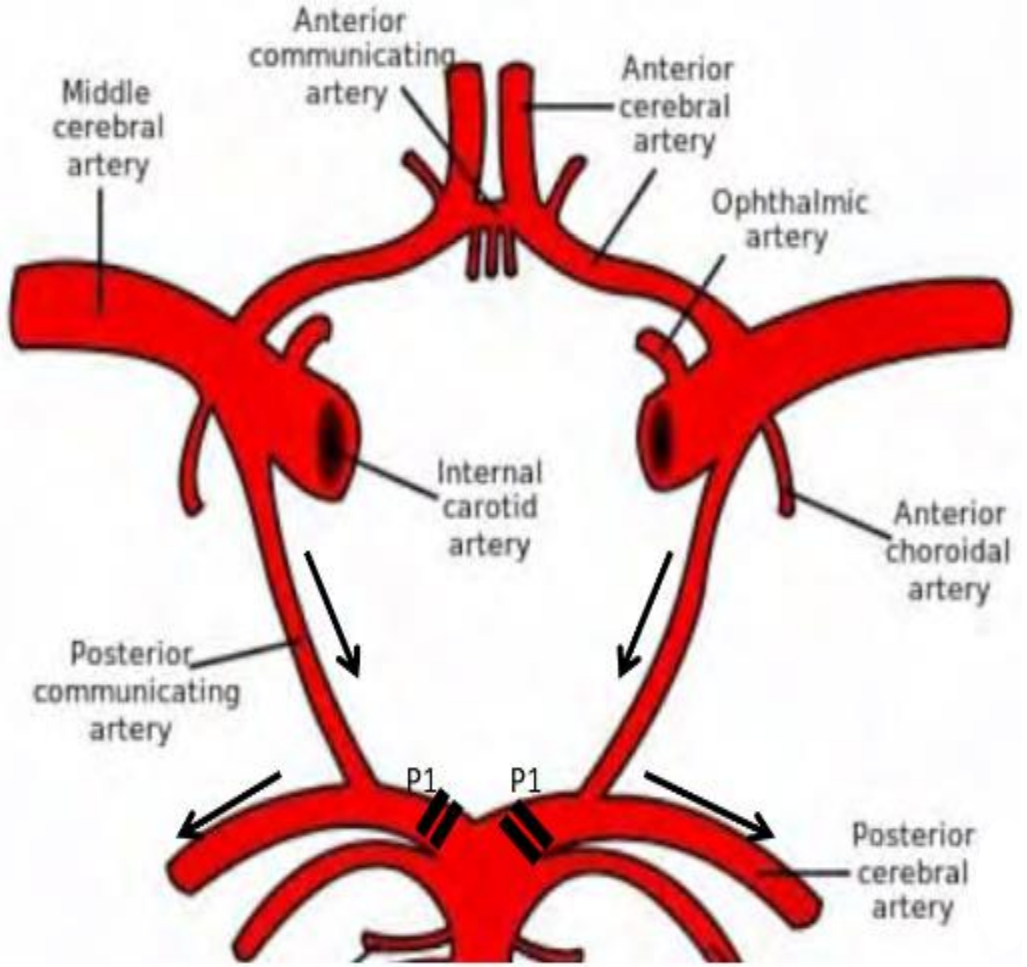
- **Anterior part:**

Anterior cerebral & anterior communicating arteries.

- **Posterior part:**

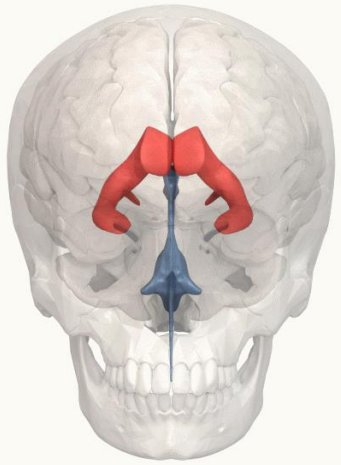
Posterior cerebral & posterior communicating arteries

- **Lateral part:** middle cerebral artery.

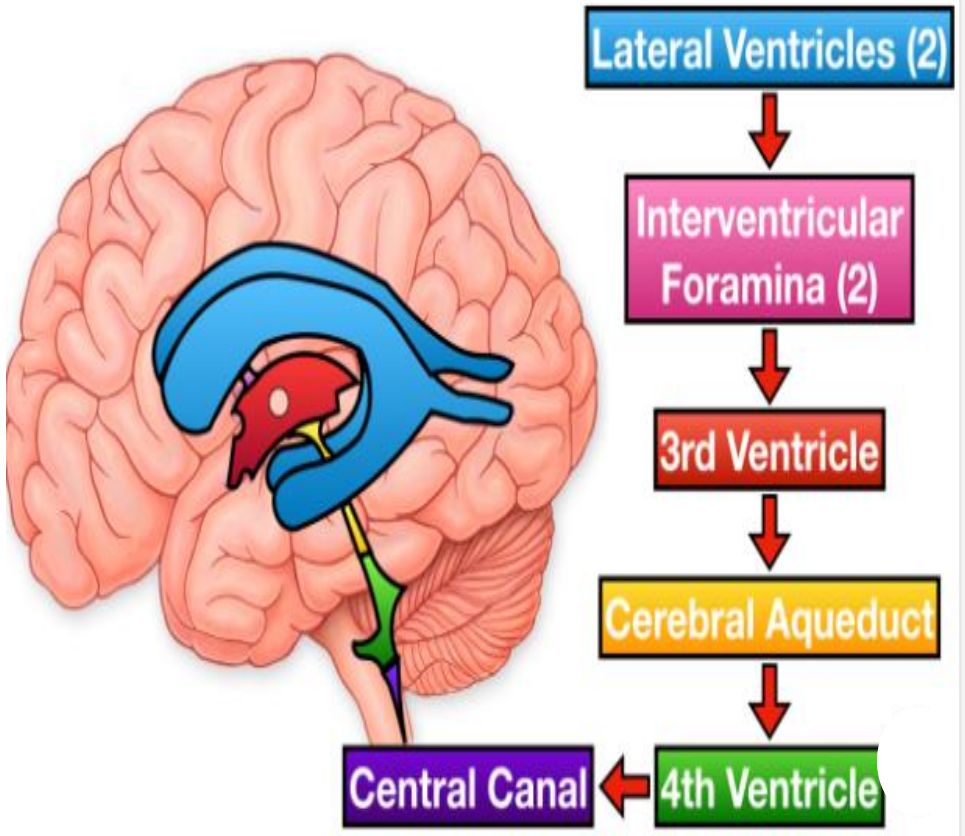


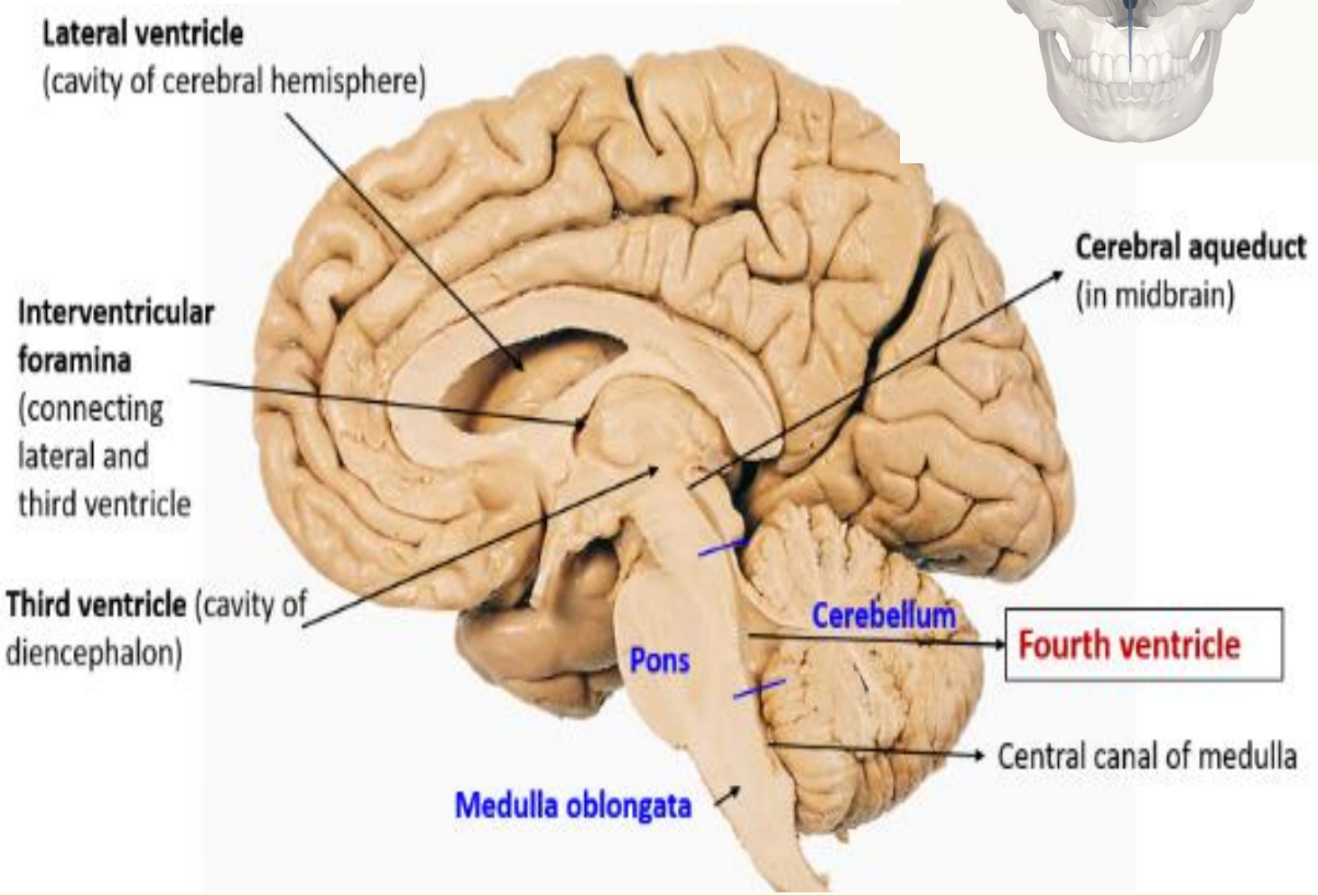
OSPE !!!! مهم جدا : Blood supply of thalamus is mainly by : Posterior cerebral artery

3rd ventricle

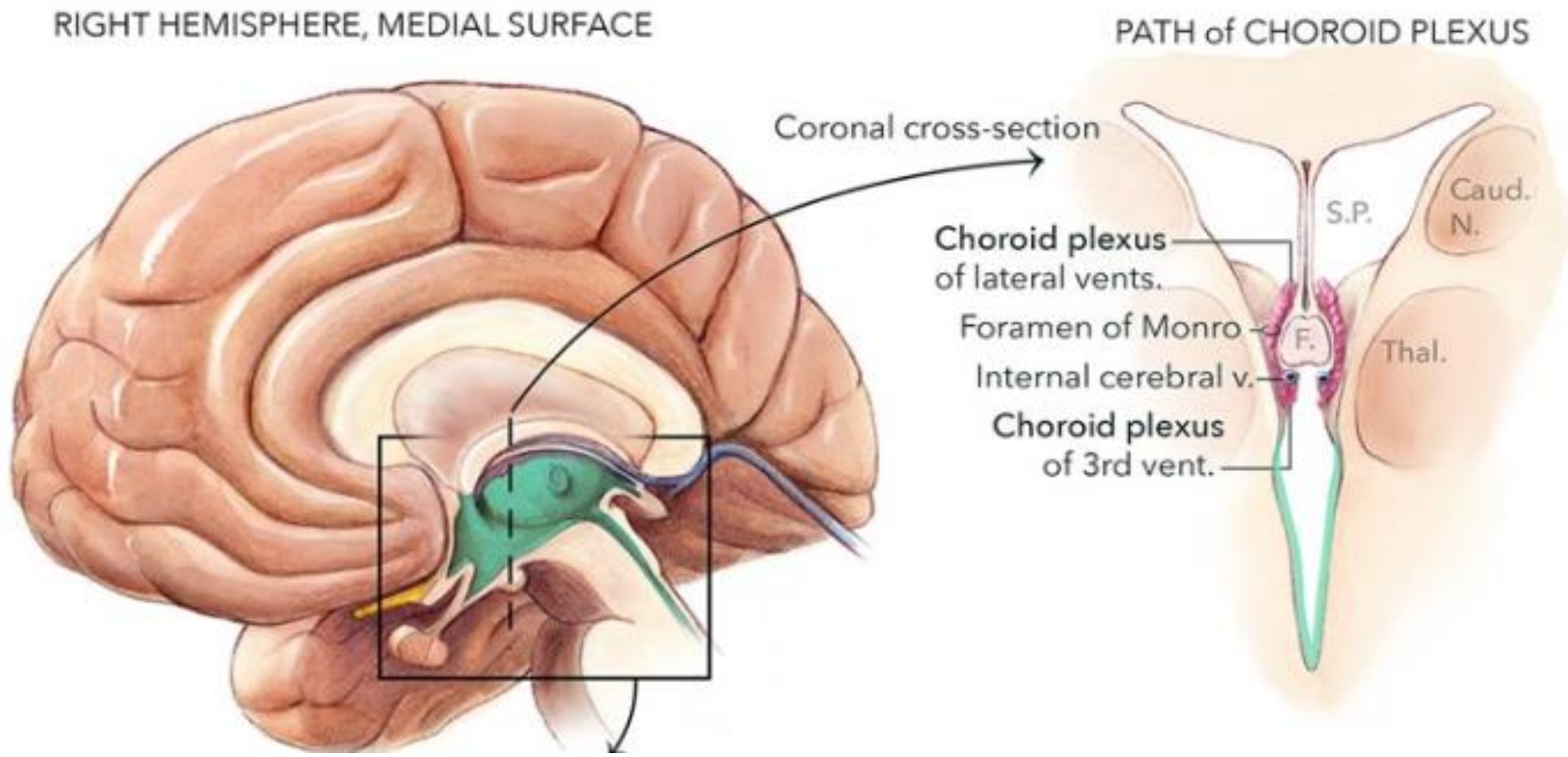


Definition: it is the cavity of the diencephalon





3rd ventricle

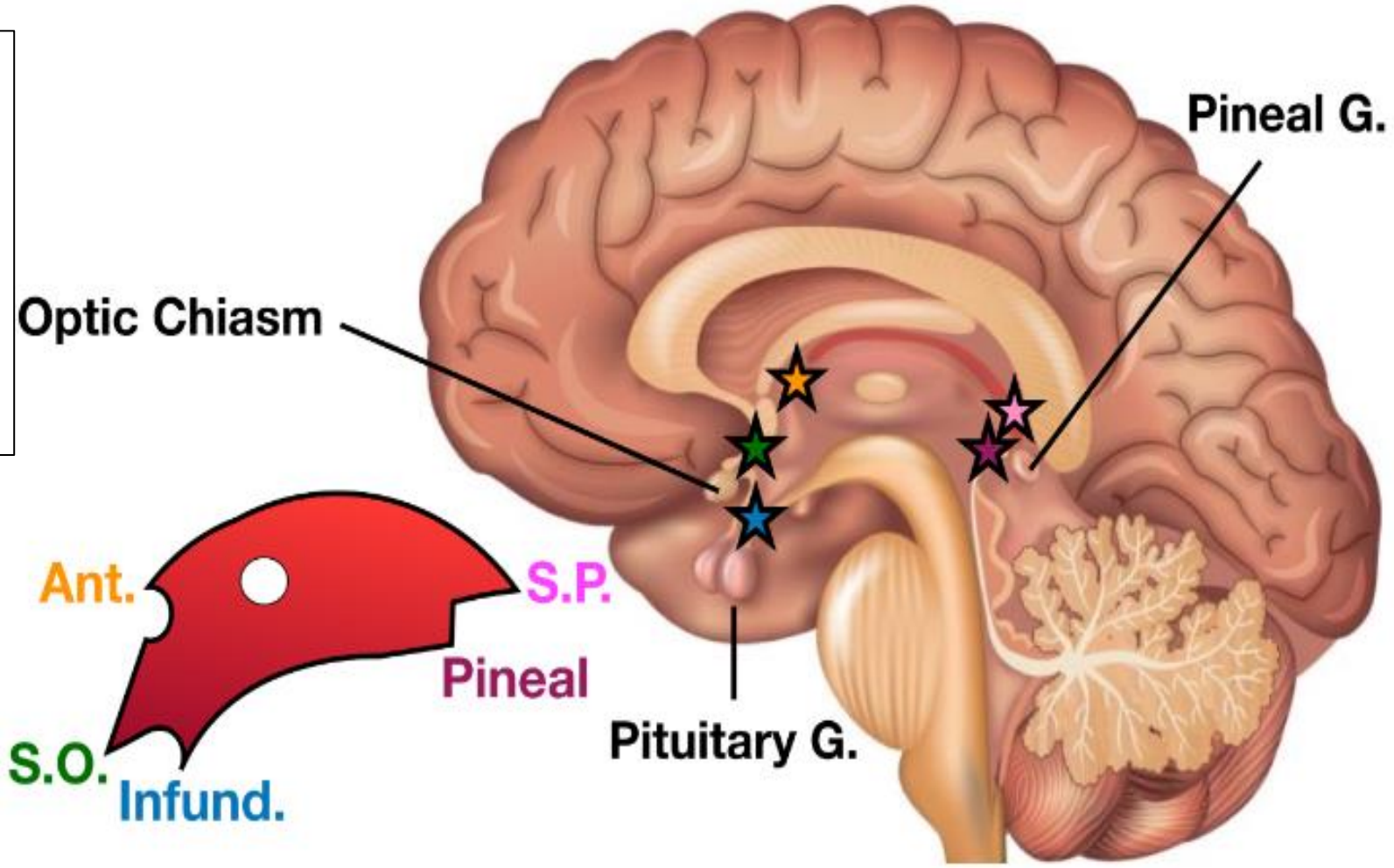


3rd ventricle

Recesses :

مهمة

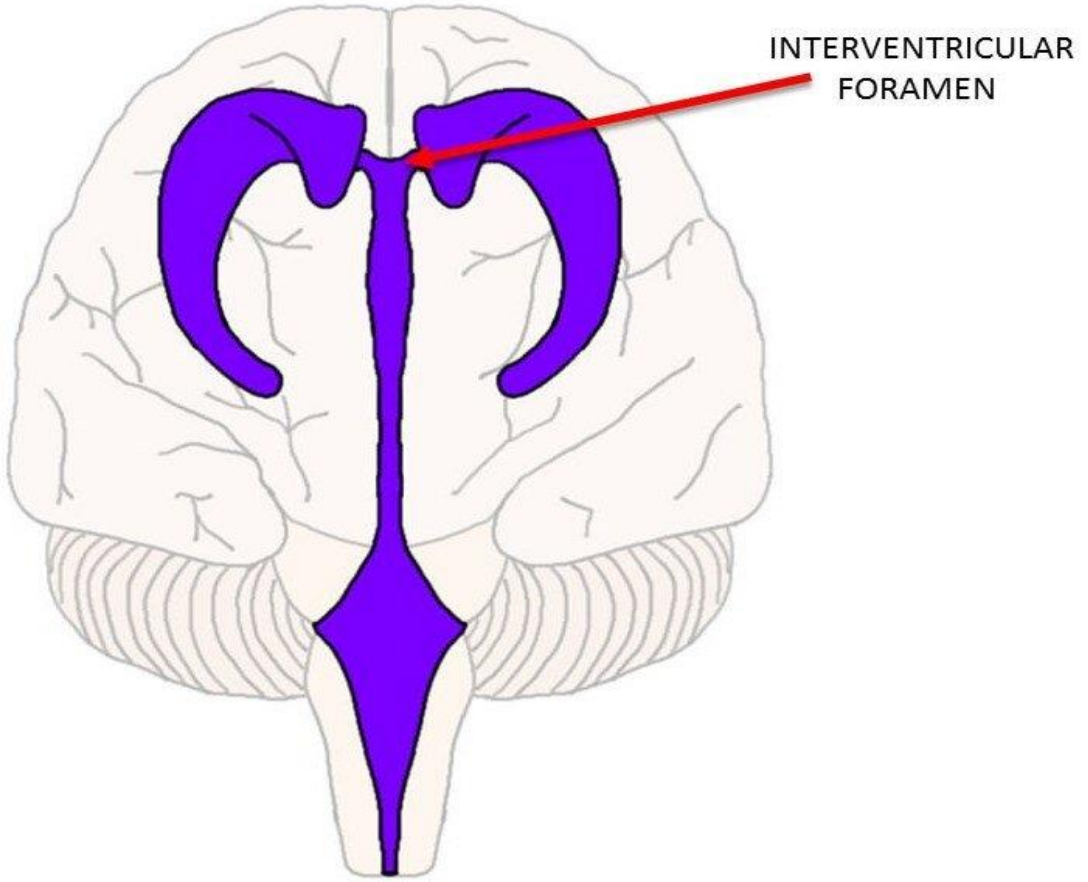
1. **Optic recess:** above the optic chiasma.
2. **Infundibular recess:** extends into the infundibulum.
3. **Pineal recess:** extends into the stalk of the pineal gland.
4. **Suprapineal recess:** above the pineal gland.



3rd ventricle

Communications :

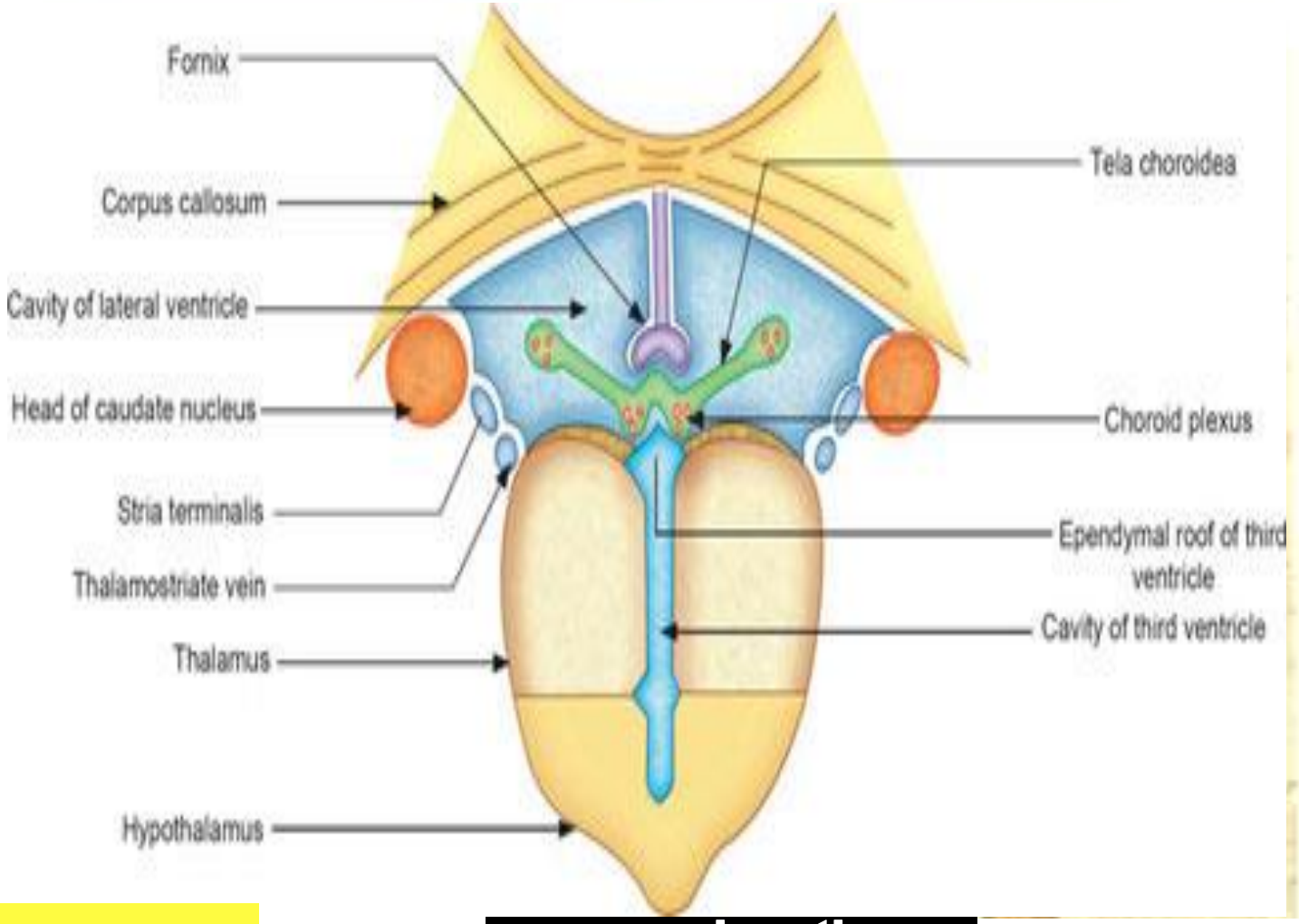
- **With the lateral ventricles:** through the interventricular foramina of Monro.
- **With the fourth ventricle:** through the cerebral aqueduct of Sylvius.



3rd ventricle

Choriod plexus of 3rd :

- **Site:** projects downward from roof of the 3rd ventricle.
- **Shape:** 2 vascular ridges, one on each side of midline.
- **Supplied by** the posterior choroidal artery (branch from the posterior cerebral artery).

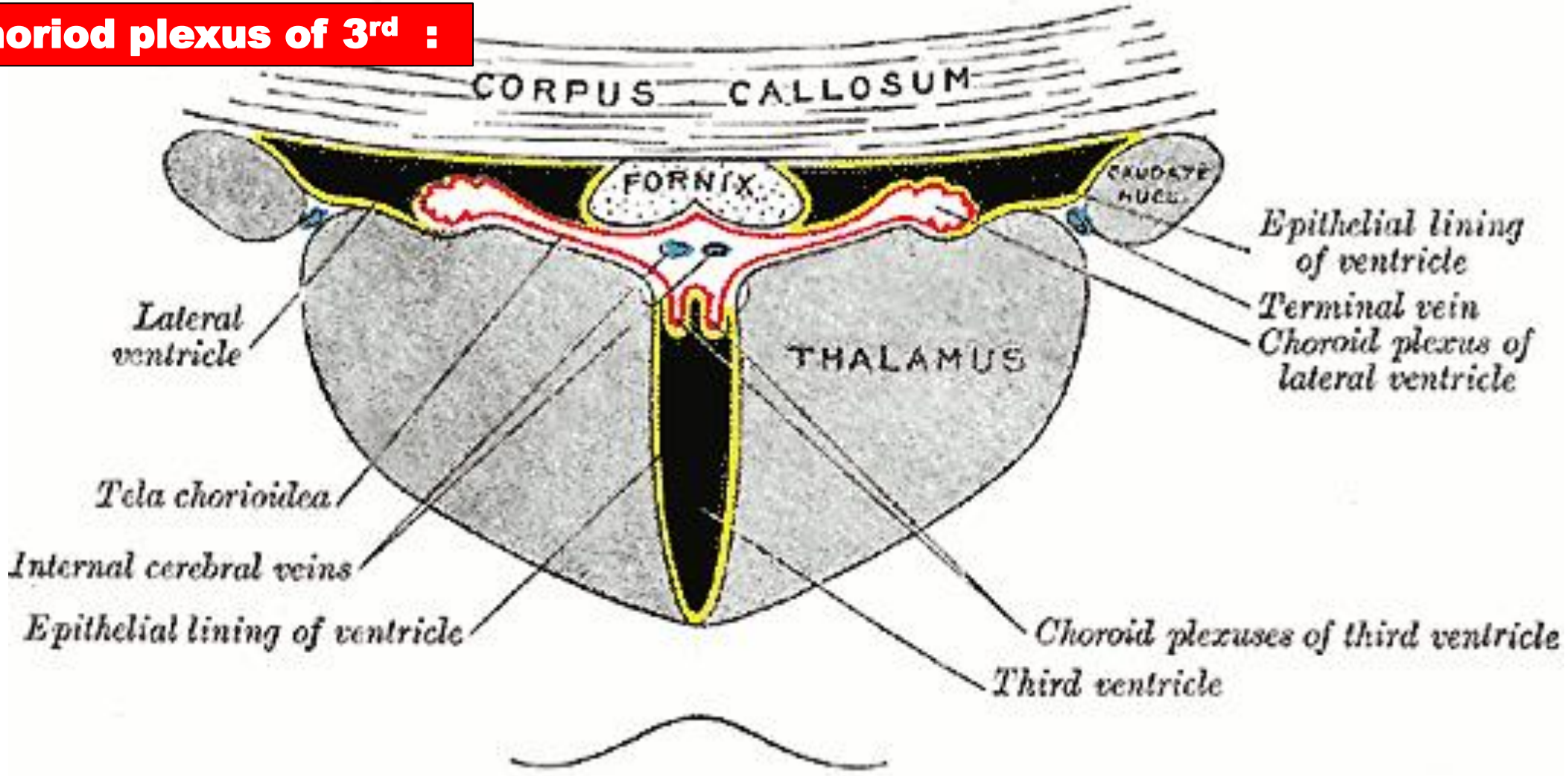


coronal section

OSPE !!! مهم جدا: Choroid plexus supplied by ?

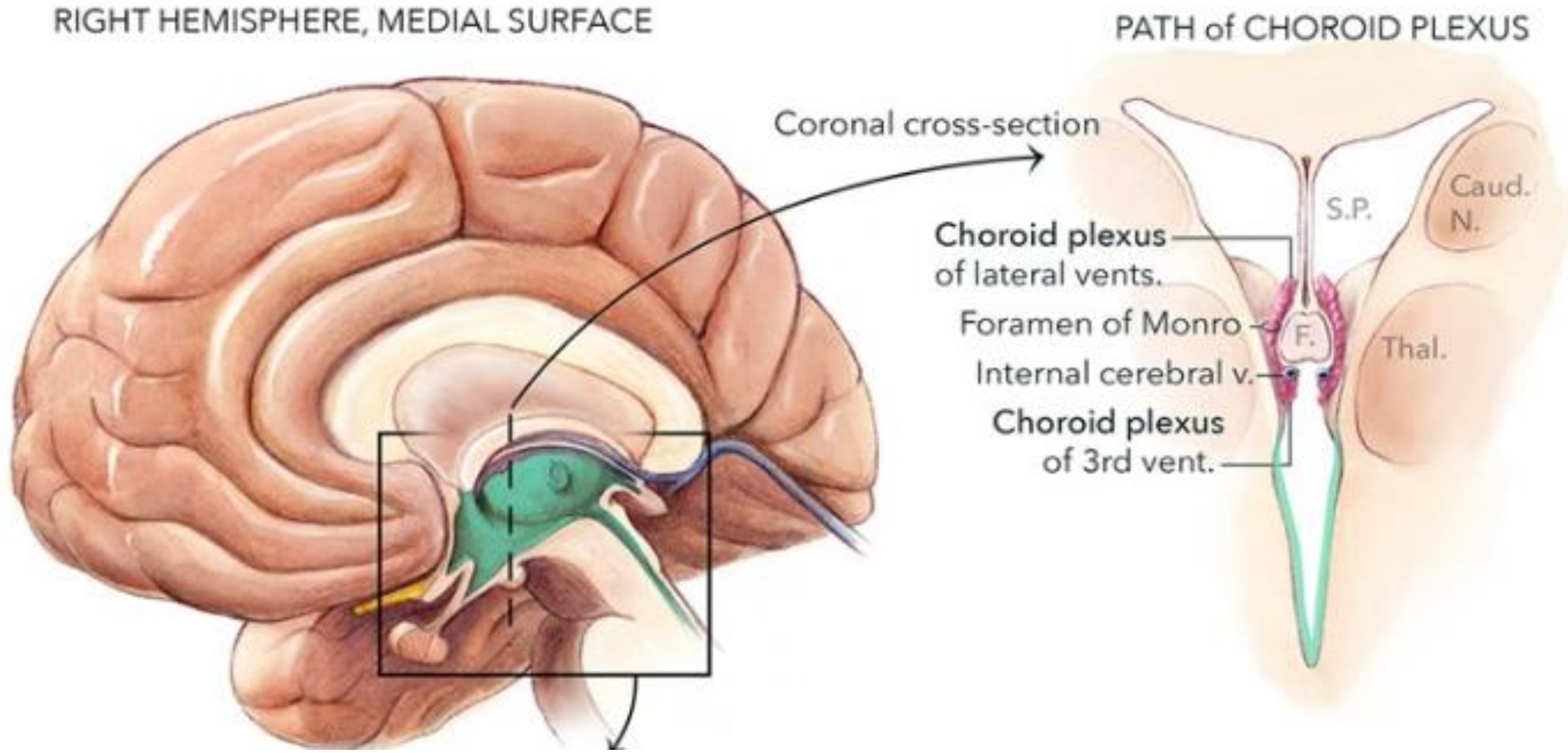
3rd ventricle

Choriod plexus of 3rd :



3rd ventricle

Choriod plexus of 3rd :



Quiz

The choroid plexus of 3rd ventricle is supplied by ?

A. Superior cerebellar artery .
B. Posterior cerebral artery.
C. Posterior inferior cerebellar artery .
D. Middle cerebral artery.
E. Anterior cerebral artery.

The answer is B

WITH NOTES

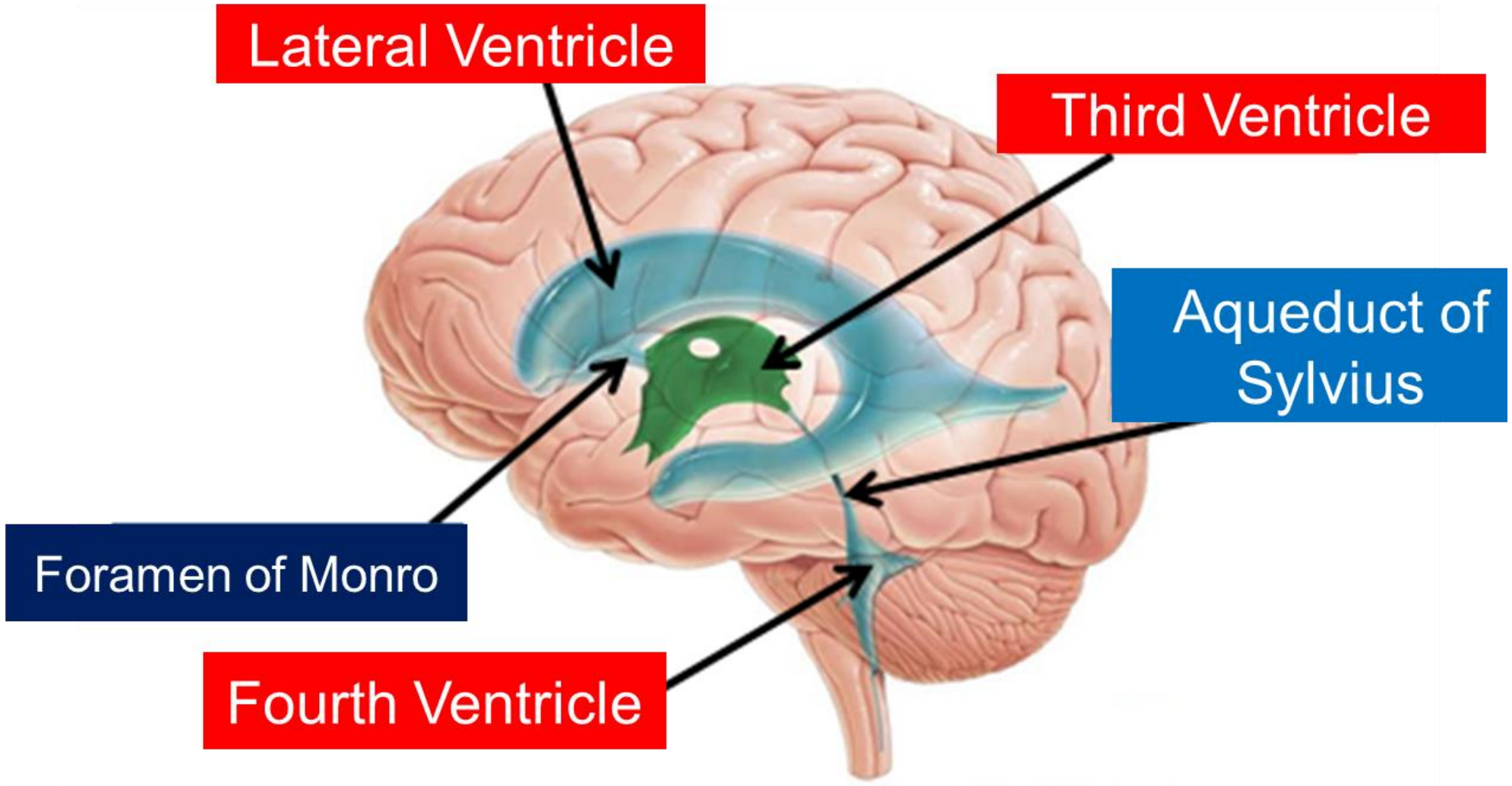
Horizontal and Sagittal Sections of the Brain (Basal Ganglia & White Matter)

By:

Dr. Mohamed Galal

Department of human Anatomy and Embryology
Faculty of Medicine
Mansoura National University, Egypt

Ventricular System of the Brain



Lateral Ventricle

Parts:

1- Anterior (frontal) horn:

in the frontal lobe**.**

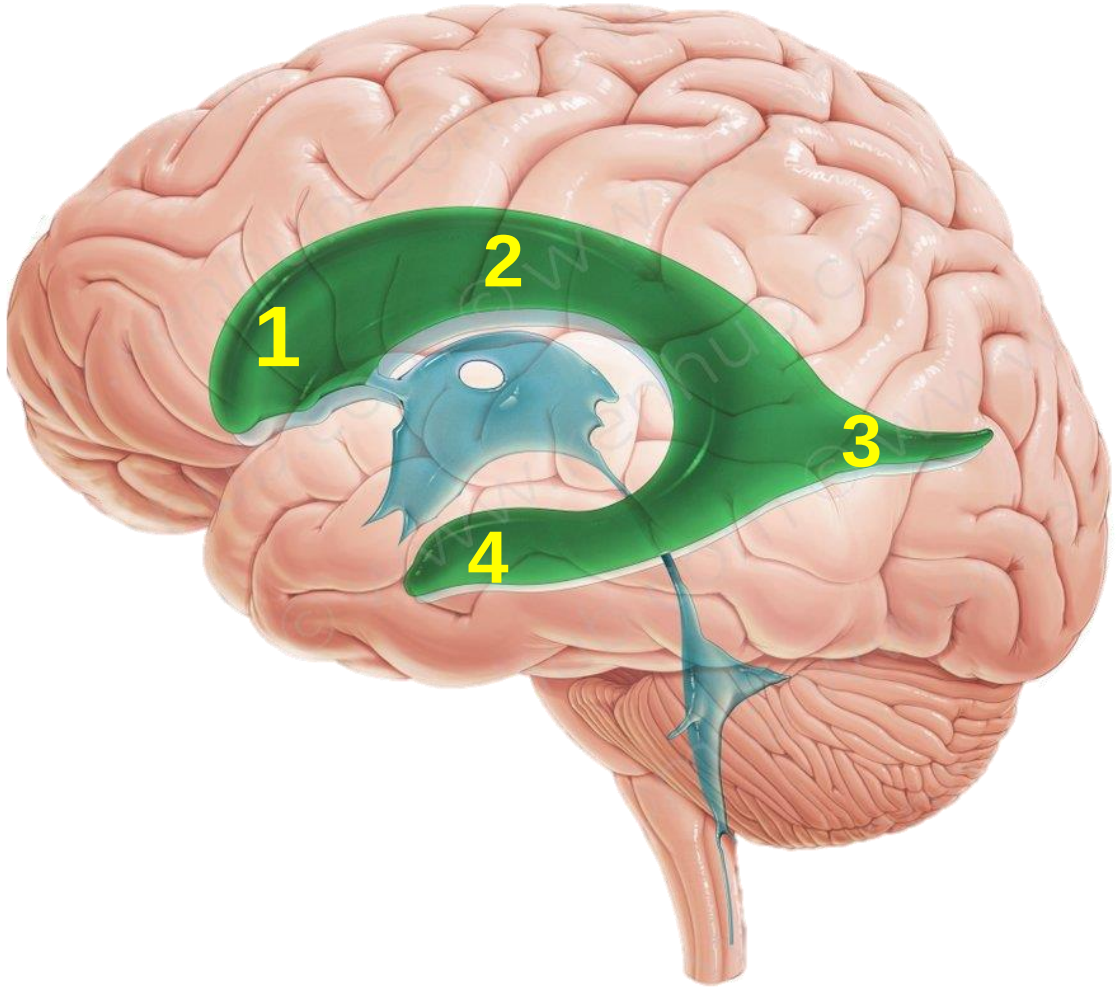
2- Body: in the parietal lobe**.**

3- Posterior (occipital) horn:

in the occipital lobe.

4- Inferior (temporal) horn:

in the temporal lobe.



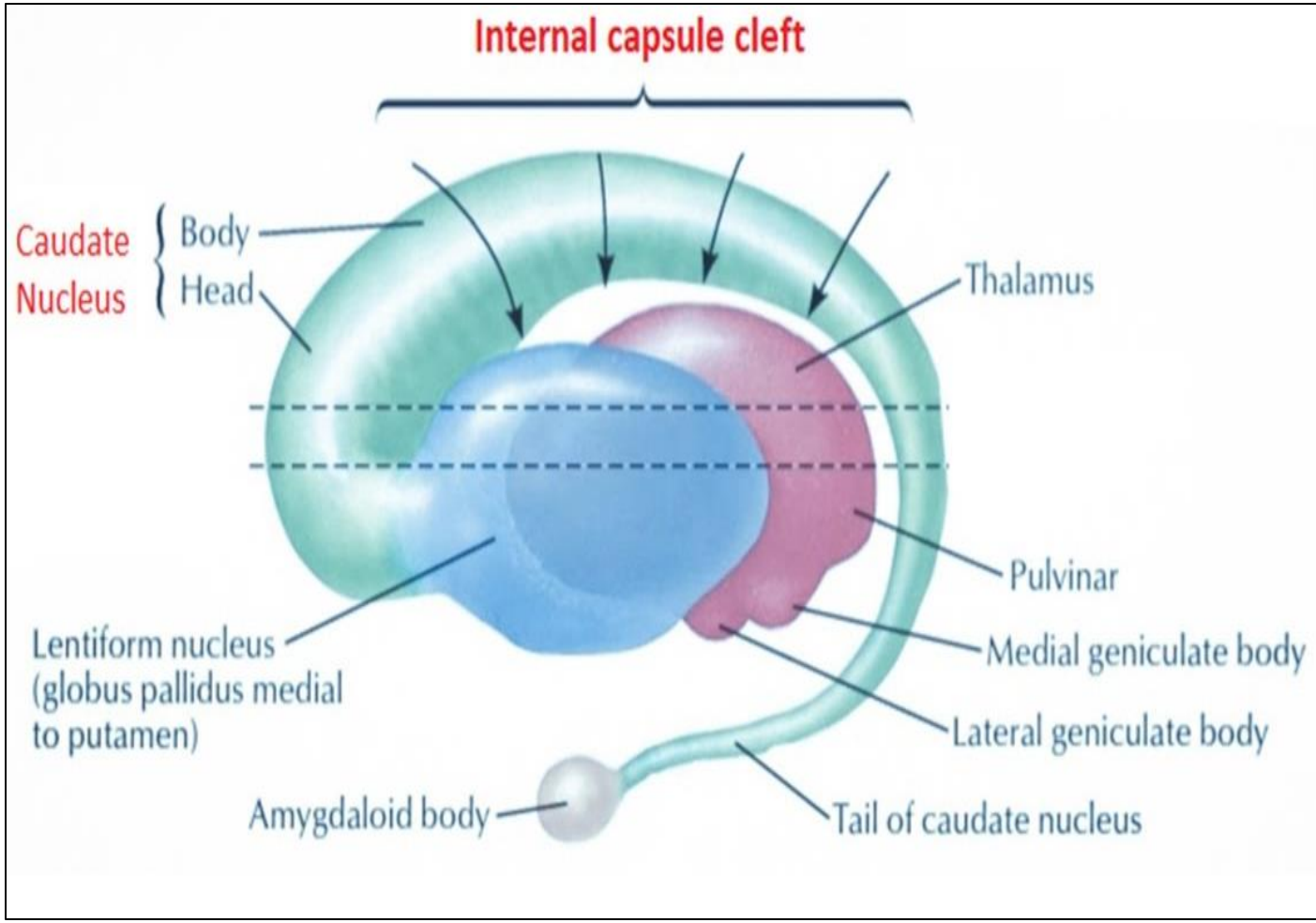
Basal Ganglia

They are composed of:

Corpus Striatum: formed of:

- Caudate nucleus: has
  - ❖ Head.
  - ❖ Body.
  - ❖ Tail.
- Lentiform nucleus: made up of
  - ❑ Globus pallidus (medially)
  - ❑ Putamen (laterally)

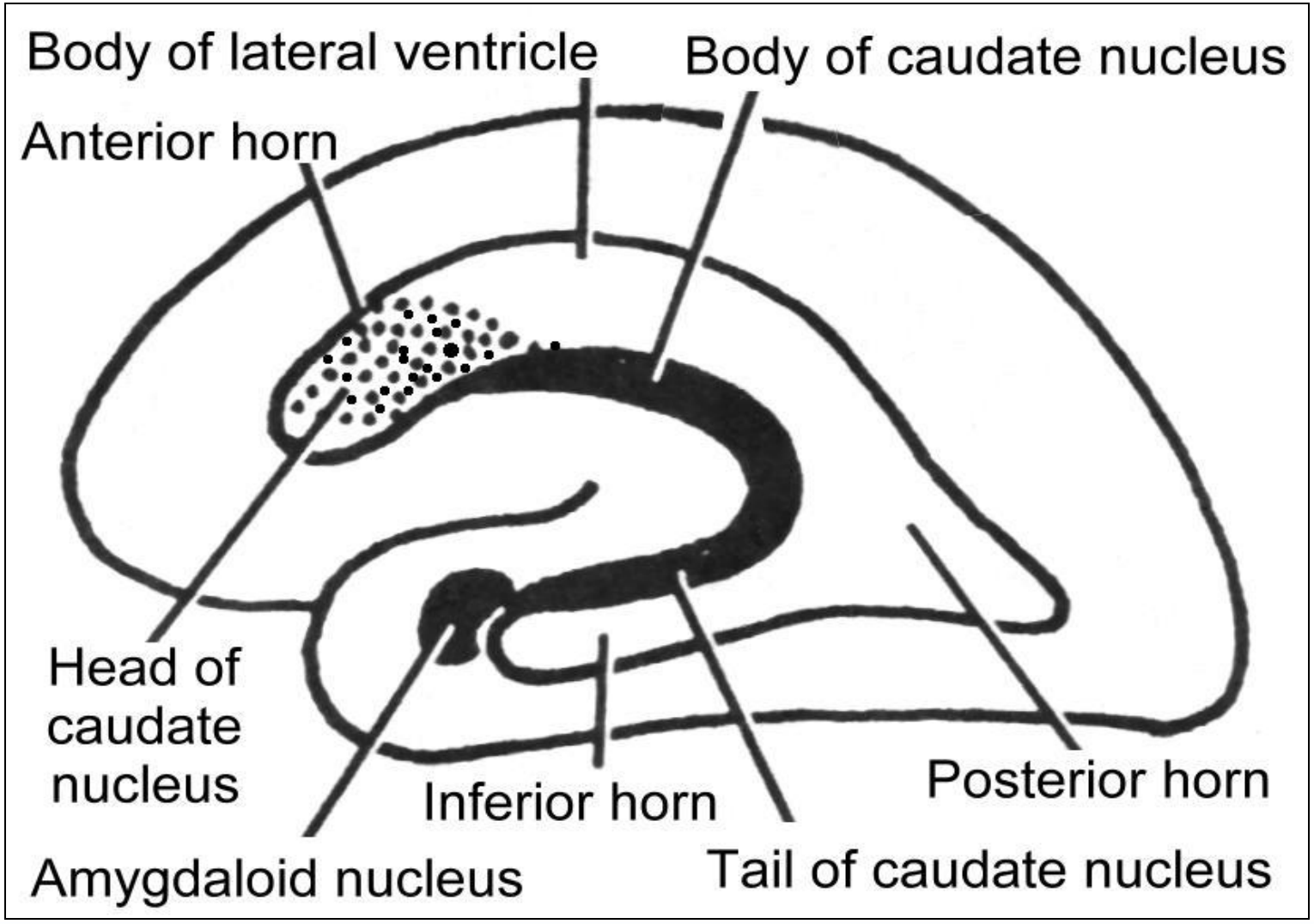
- **Amygdaloid nucleus**
- **Claustrum**



Relation of Basal Ganglia to Lateral ventricle

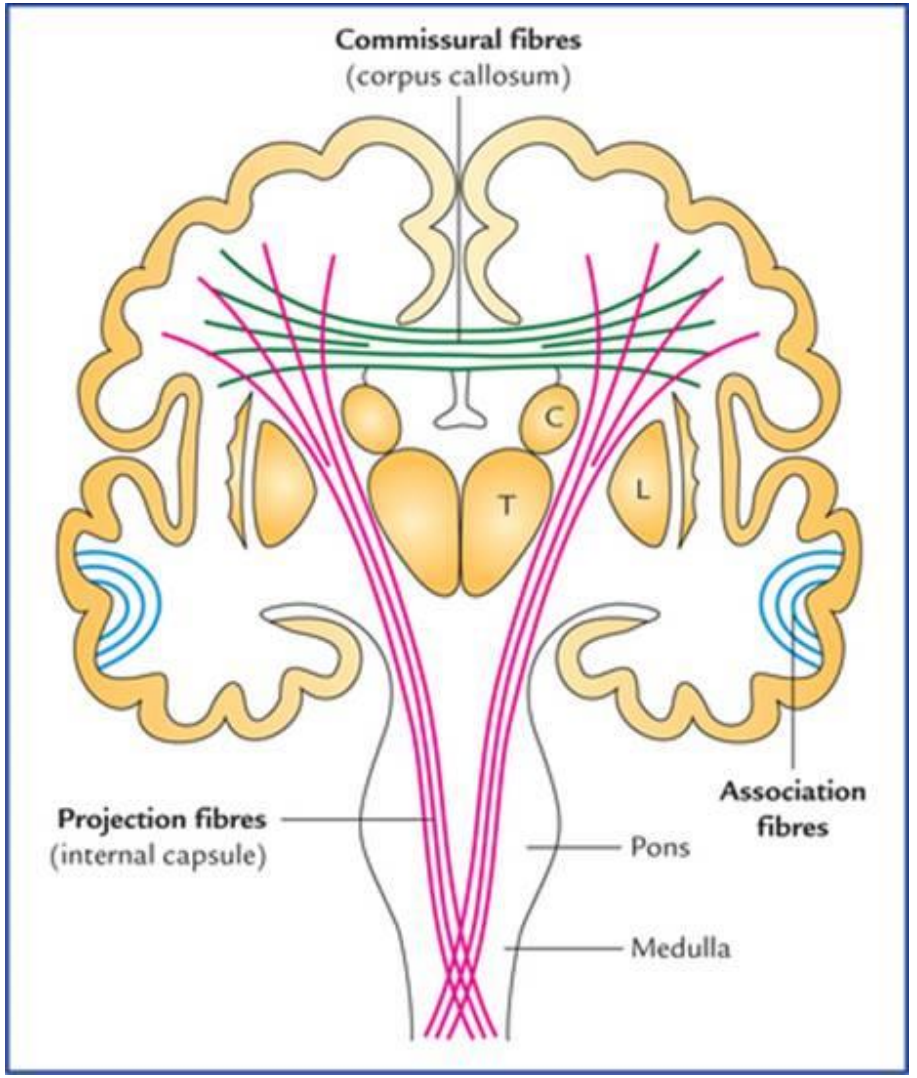
- Head of caudate → Lateral wall of anterior horn.
- Body of caudate → Floor of the body.
- Tail of caudate → Roof of inferior horn.
- Amygdaloid nucleus → Roof of inferior horn.

مهمة جداااا



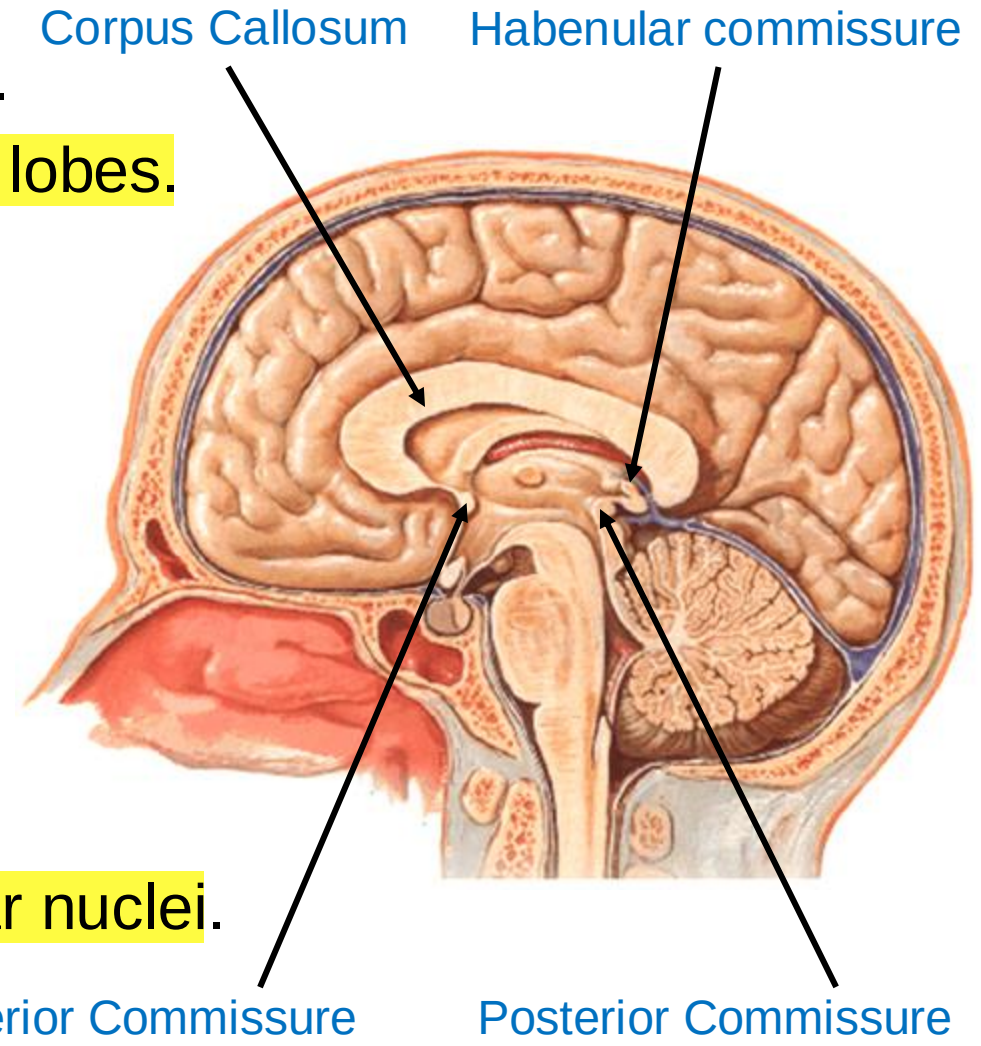
White Matter of the brain

- Three types of nerve fibers:
  1. **Association fibers**: connect different areas of the same cerebral hemisphere.
  2. **Commissural fibers**: connect the same area of the two cerebral hemispheres.
  3. **Projection fibers**: connect the cerebral hemisphere with subcortical areas.



Commissural Fibers

1. **Corpus Callosum**: the largest & main commissure.
2. **Anterior Commissure:** connects the two temporal lobes.
3. **Posterior Commissure:** connects:
   a) The two superior colliculi.
   b) The pretectal and Edinger Westphal nuclei for bilateral light reflex.
   c) The two oculomotor nuclei for upward gaze.
4. **Hippocampal Commissure**:
   connect the 2 fornices and the 2 hippocampi.
5. **Habenular Commissure**: connects the 2 habenular nuclei.

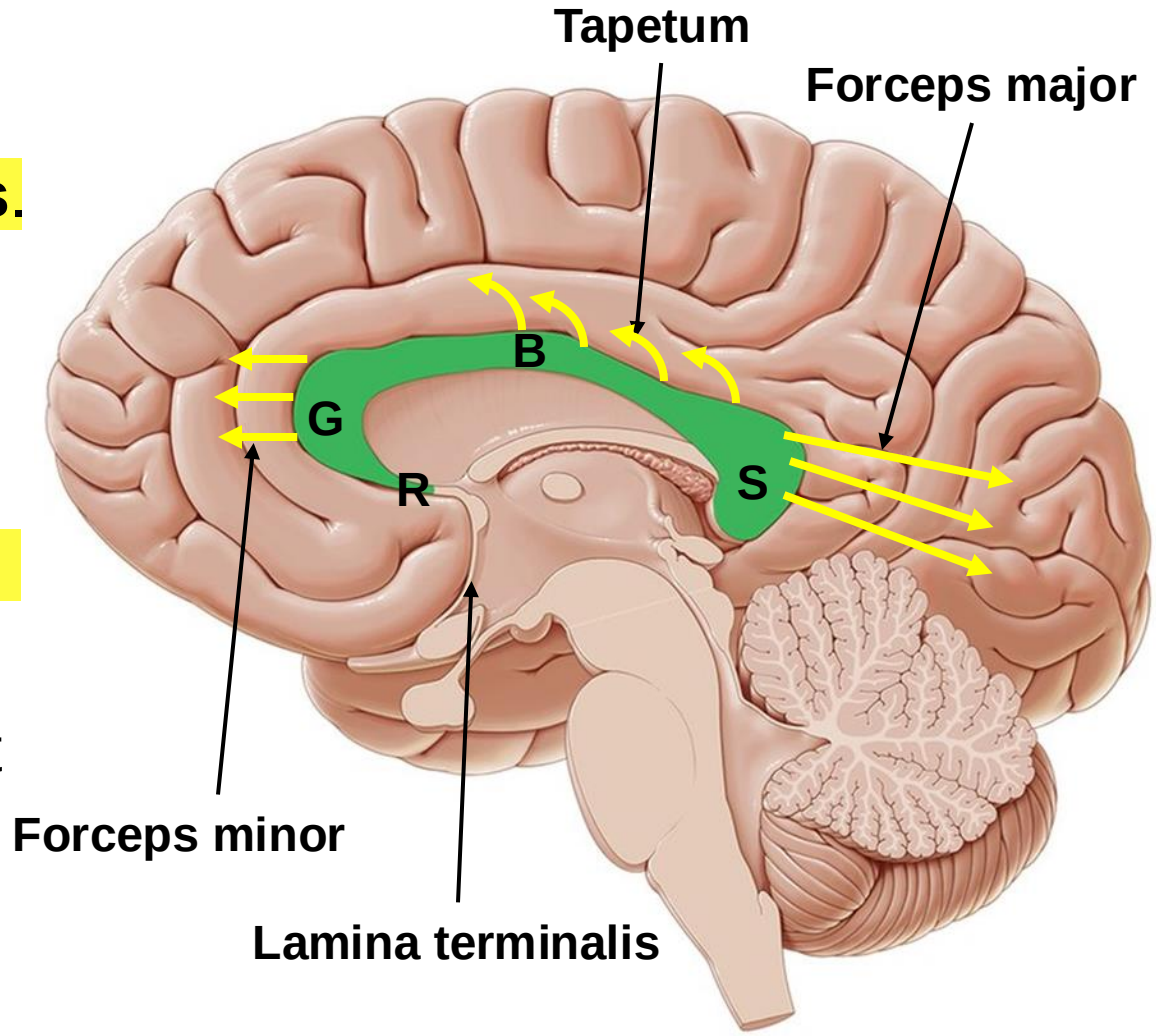


OSPE : Identify? Connect ?

Commissural Fibers: Corpus Callosum

Parts:

1. **Rostrum**: continuous with **lamina terminalis**.
2. **Genu**: fibers form **forceps minor** that connect the two **frontal** lobes.
3. **Body**: form a radiation of posterior fibers called **tapetum** connecting the two **temporal** lobes.
4. **Splenium**: its fibers form **forceps major** that connect the two **occipital** lobes.



OSPE : Identify? Connect ?

OSPE مهم جداا: Identify? Connect ?

OSPE مهم : Function of Cingulum ?

Association Fibers

- **Short association fibers:**

  Connect adjacent areas (arcuate fibers).

- **Long fibers**: Connect distant cortical areas.

1. **Cingulum**: connects the limbic lobe.

   Cingulate gyrus →

   Parahippocampal gyrus → Uncus.

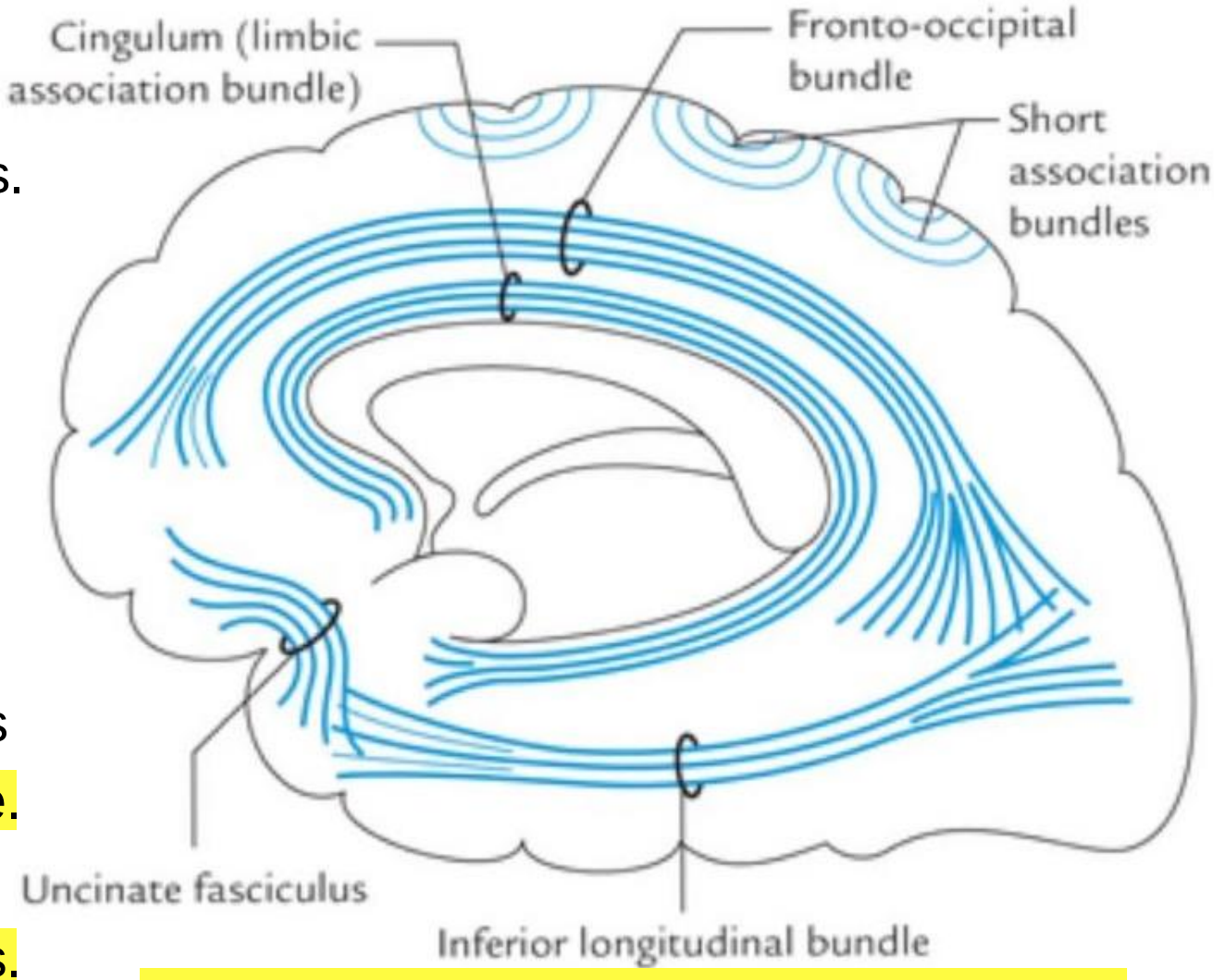
2. **Superior longitudinal bundle** (**arcuate fasciculus**):

   connects the 4 lobes together.

3. **Inferior longitudinal bundle**: connects the temporal lobe with the occipital lobe.

4. **Uncinate fasciculus**:

   connects the frontal and temporal lobes.



مهمة جداااا والدكتور قال بيحبوا يجيبوها في الامتحانات

Projection Fibers

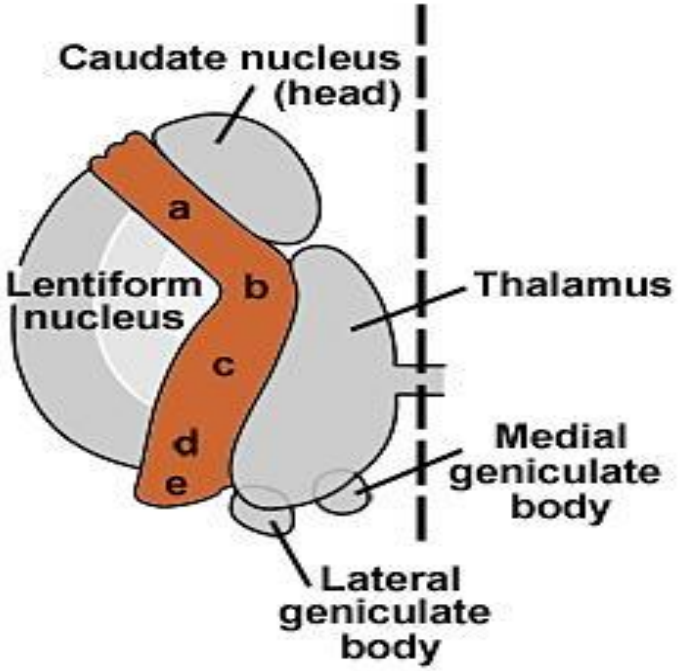
- **Form a bundle called internal capsule.**
- **Parts of internal capsule:**

1. **Anterior limb:**
   between the lentiform nucleus and the head of the caudate nucleus.
2. **Genu:** opposite the apex of the lentiform nucleus.
3. **Posterior limb:**

   I. **Lenticulothalamic part:**
   between the lentiform nucleus and the thalamus.

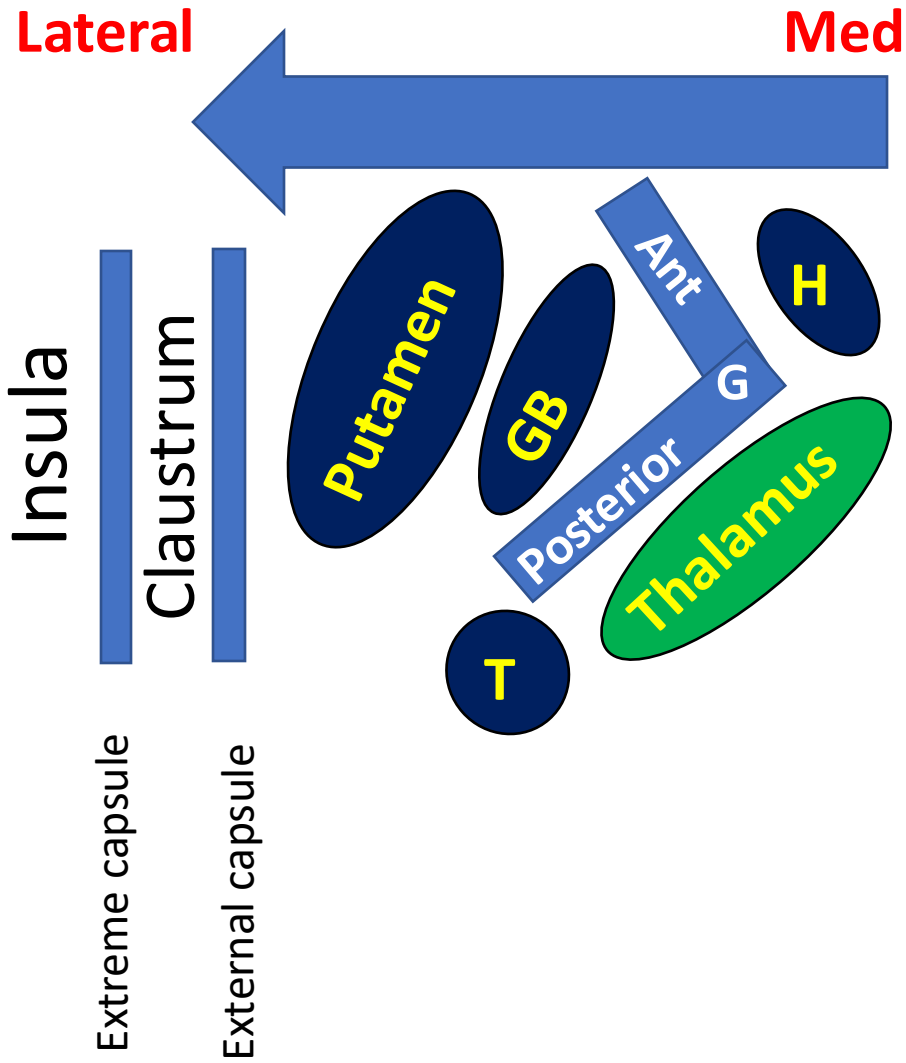
   II. **Retrolenticular part:**
   behind the lentiform nucleus.

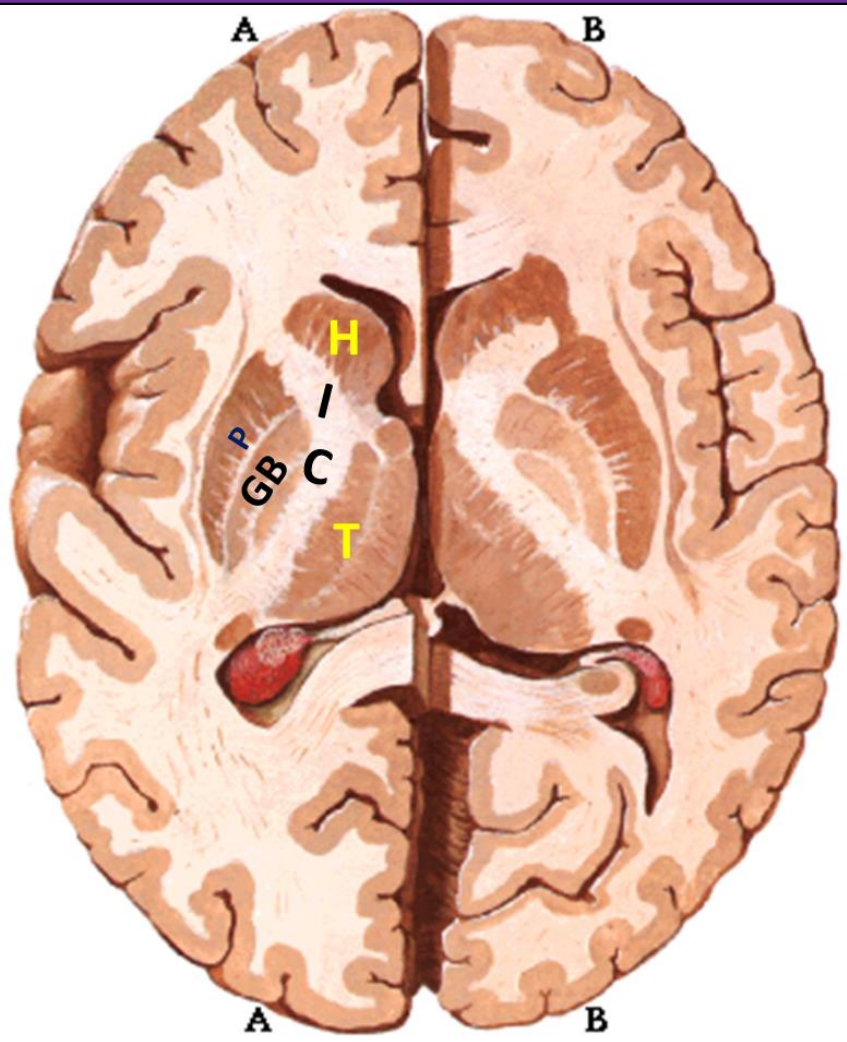
   III. **Sublenticular part:**
   below the lentiform nucleus



Parts of internal capsule:
a. Anterior limb
b. Genu
c. Posterior limb
d. Sublenticular part
e. Retrolenticular part

Horizontal section of the Brain

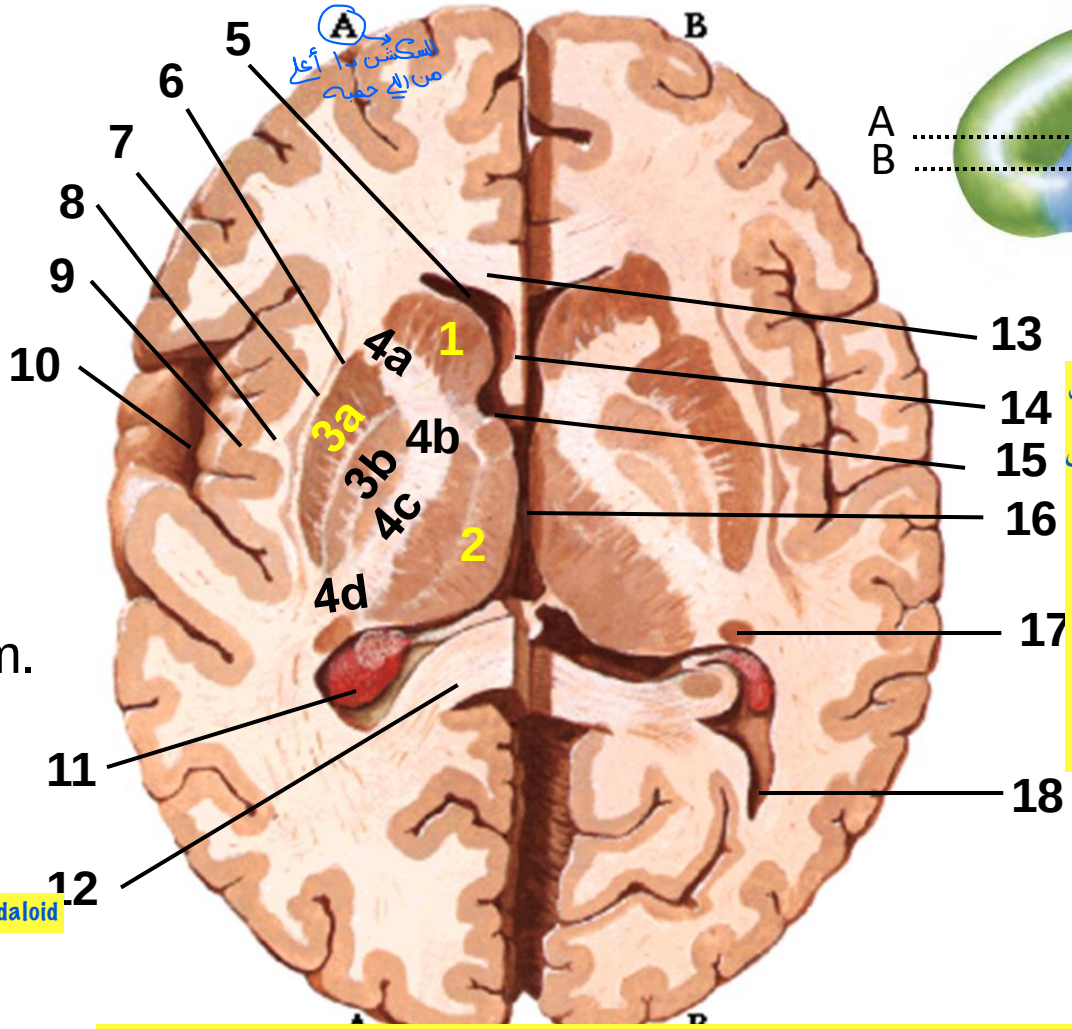


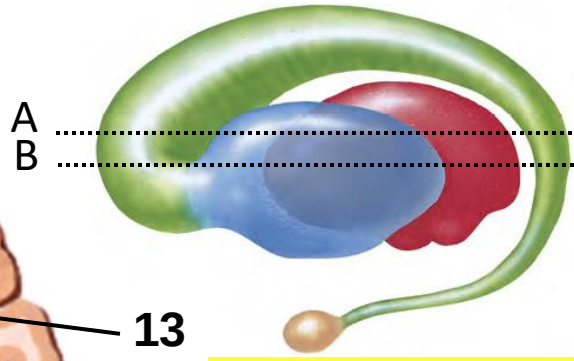


Horizontal section of the Brain

1. Head of Caudate.
2. Thalamus.
3. Lentiform nucleus.
3a. Putamen.
3b. Globus Pallidus.
4. Internal capsule:
4a. Anterior limb.
4b. Genu.
4c. Lenticulothalamic part of posterior limb.
4d. Retrolenticular part of posterior limb.
5. Anterior horn of lateral ventricle.
6. External capsule.
7. Claustrum
8. Extreme capsule.
9. Insula.
10. Lateral sulcus.
11. Choroid plexus of inferior horn.
12. Splenium of corpus callosum.
13. Genu of corpus callosum.
14. Septum pellucidum.
15. Interventricular foramen of Monro.
16. Third ventricle.
17. Tail of caudate.
18. Posterior horn of lateral ventricle.

+ Amygdaloid





* نوتس على السريع : هنعرف horizontal section من انه الثلاث كور اللي في النص
* كل الlabels لازم نعرفهم واللي متحددين بالهايلايت دول الدكتور أكد عليهم كتير

OSPE : Identify (Any label) ?
OSPE : External & Extreme capsule separate?
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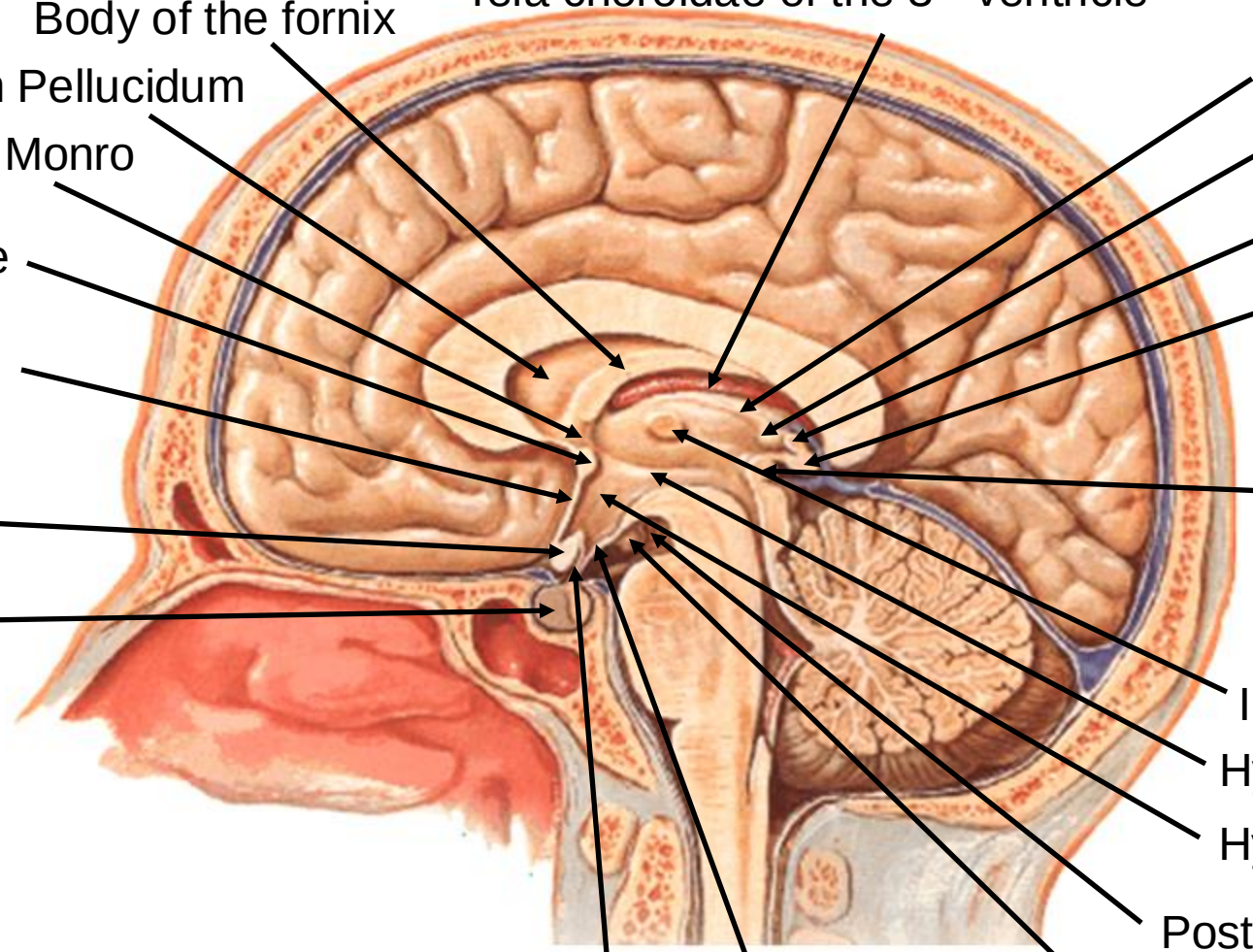
- MCA & MCV runs in Lateral sulcus

Sagittal section of the Brain



Tela choroidae of the 3rd ventricle
Body of the fornix
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Hypothalamus
Posterior perforated substance
Mamillary bodies
Tuber cinereum
Infundibulum

OSPE : Identify (Any label) ?

WITH NOTES

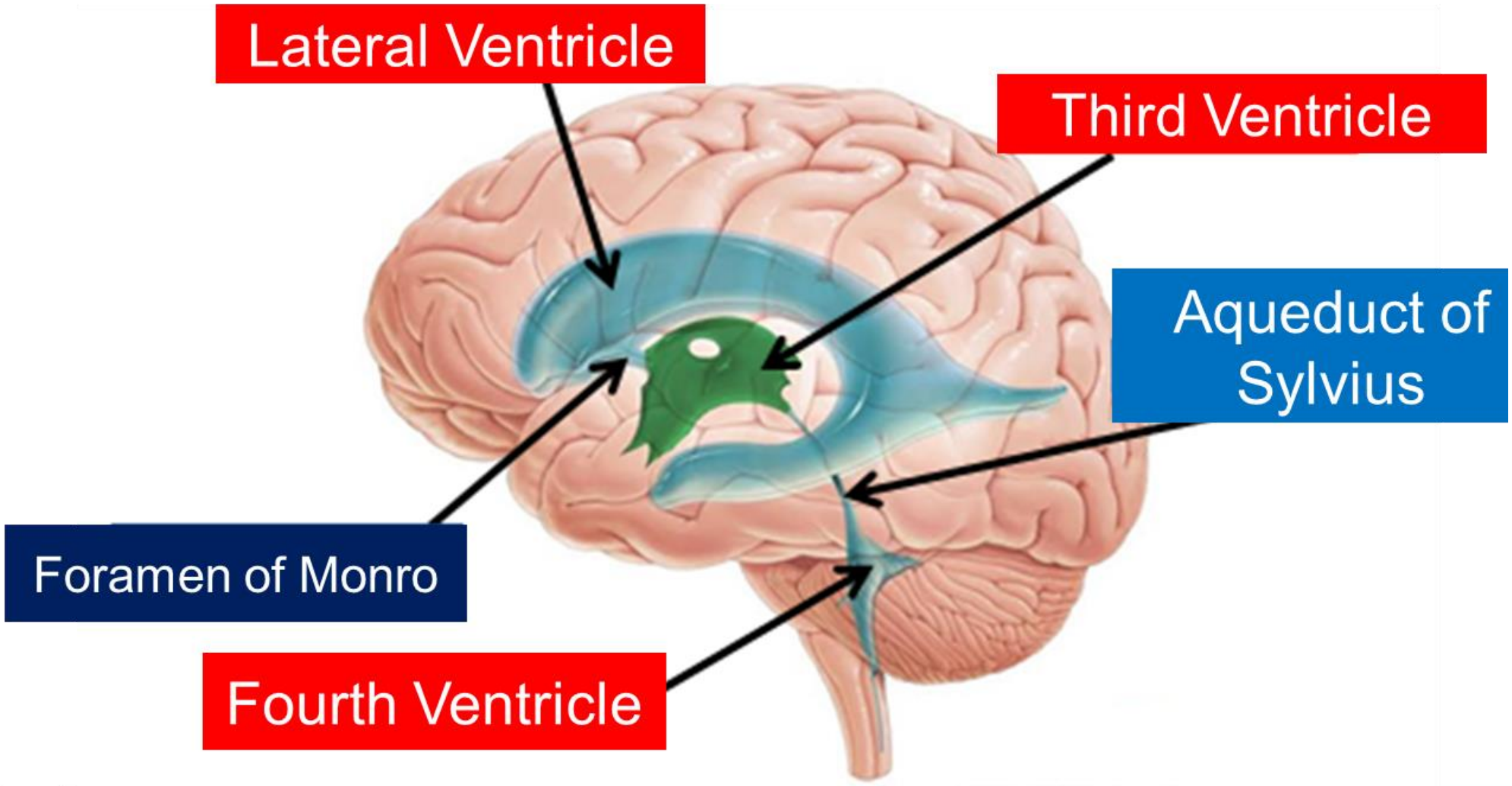
Coronal Sections of the Brain (Lateral Ventricle)

By:

Dr. Mohamed Galal

Department of human Anatomy and Embryology
Faculty of Medicine
Mansoura National University, Egypt

Ventricular System of the Brain



Lateral Ventricle

Parts:

1- Anterior (frontal) horn:

in the frontal lobe**.**

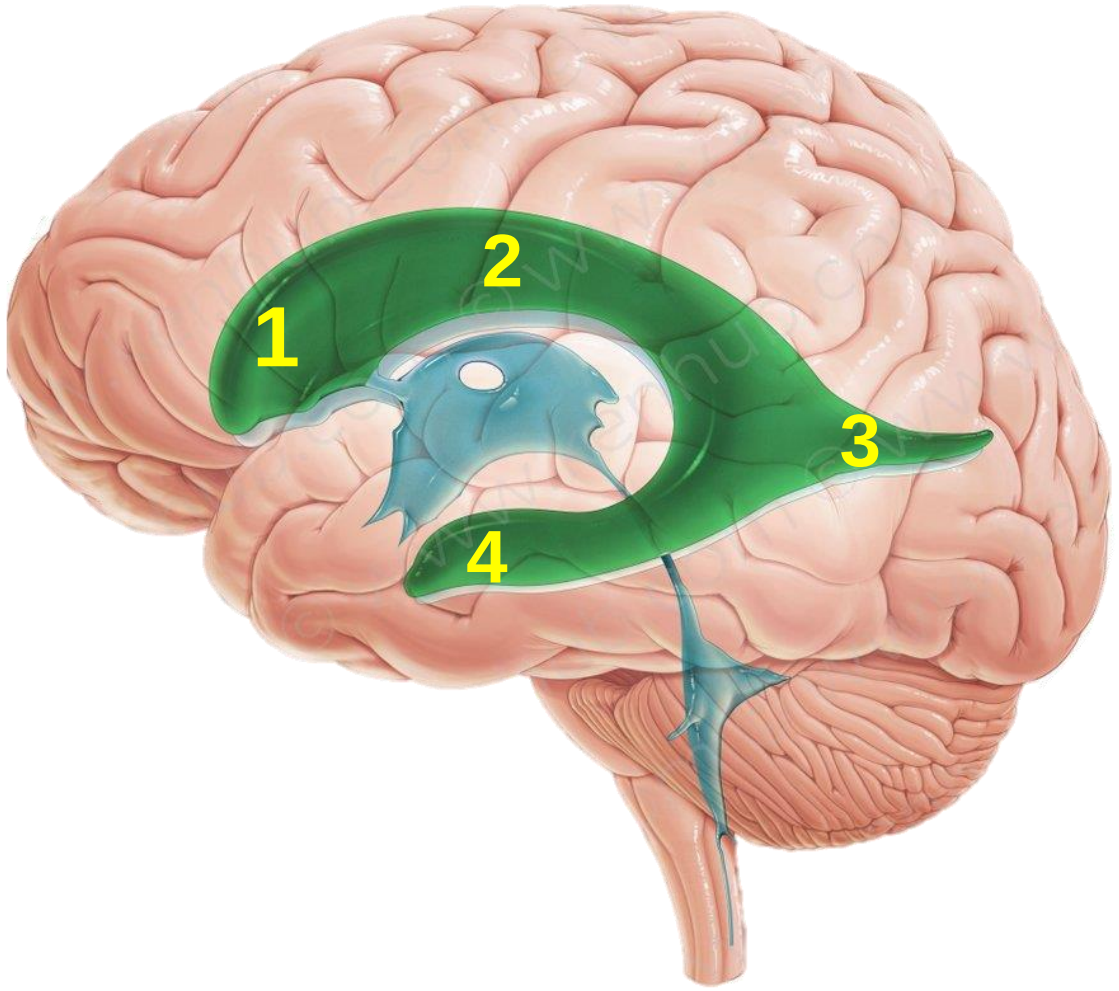
2- Body: in the parietal lobe**.**

3- Posterior (occipital) horn:

in the occipital lobe.

4- Inferior (temporal) horn:

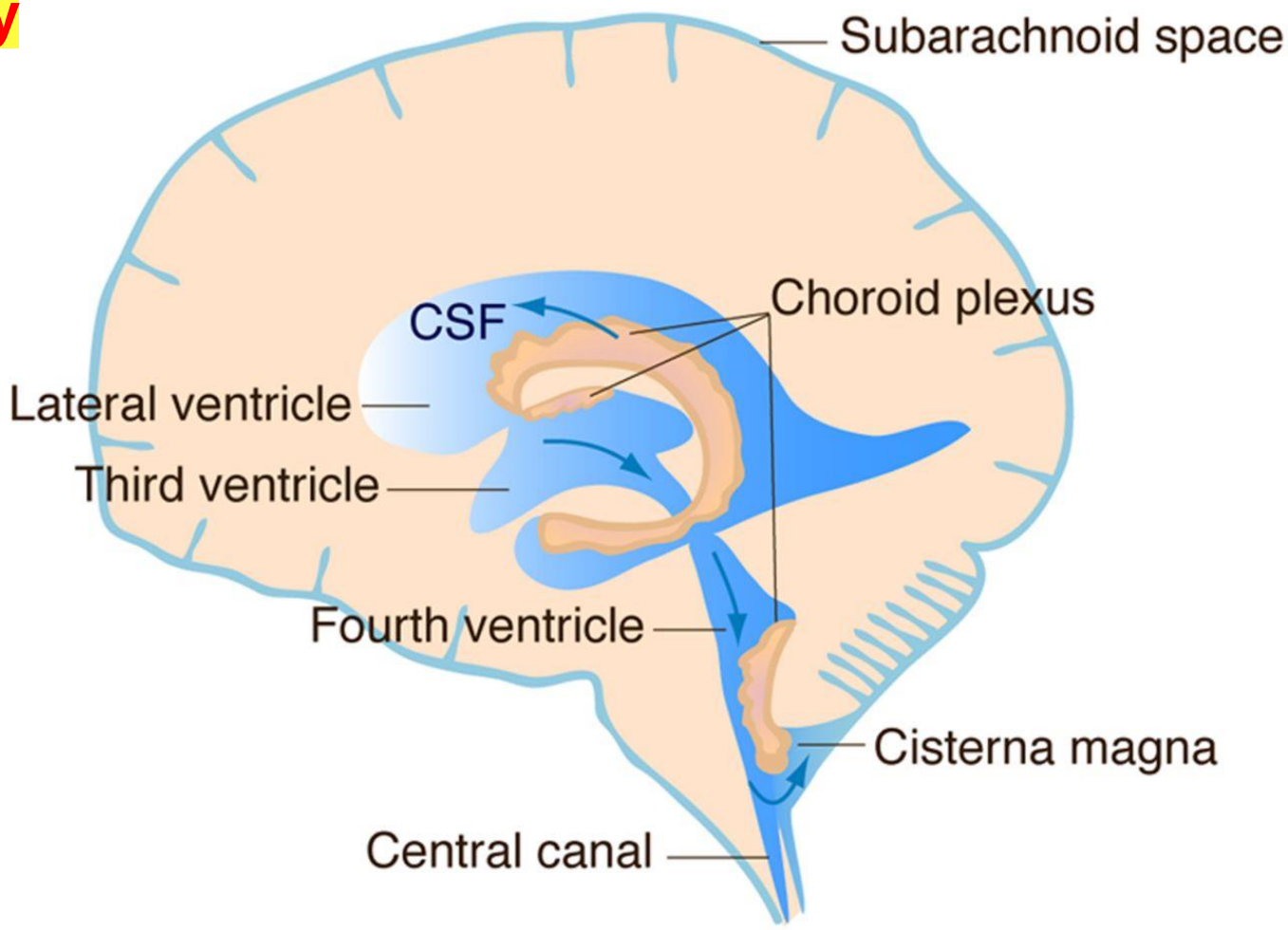
in the temporal lobe.



Choroid plexus

Choroid Plexus: site and arterial supply

- **Inferior horn of lateral ventricle** → Anterior choroidal branch (AchA) of internal carotid artery.
- **Body of lateral ventricle** → Posterior choroidal branch of posterior cerebral artery (PCA).
- **Third ventricle** → posterior choroidal branch of posterior cerebral artery (PCA).
- Fourth ventricle → Posterior Inferior Cerebellar Artery (PICA).



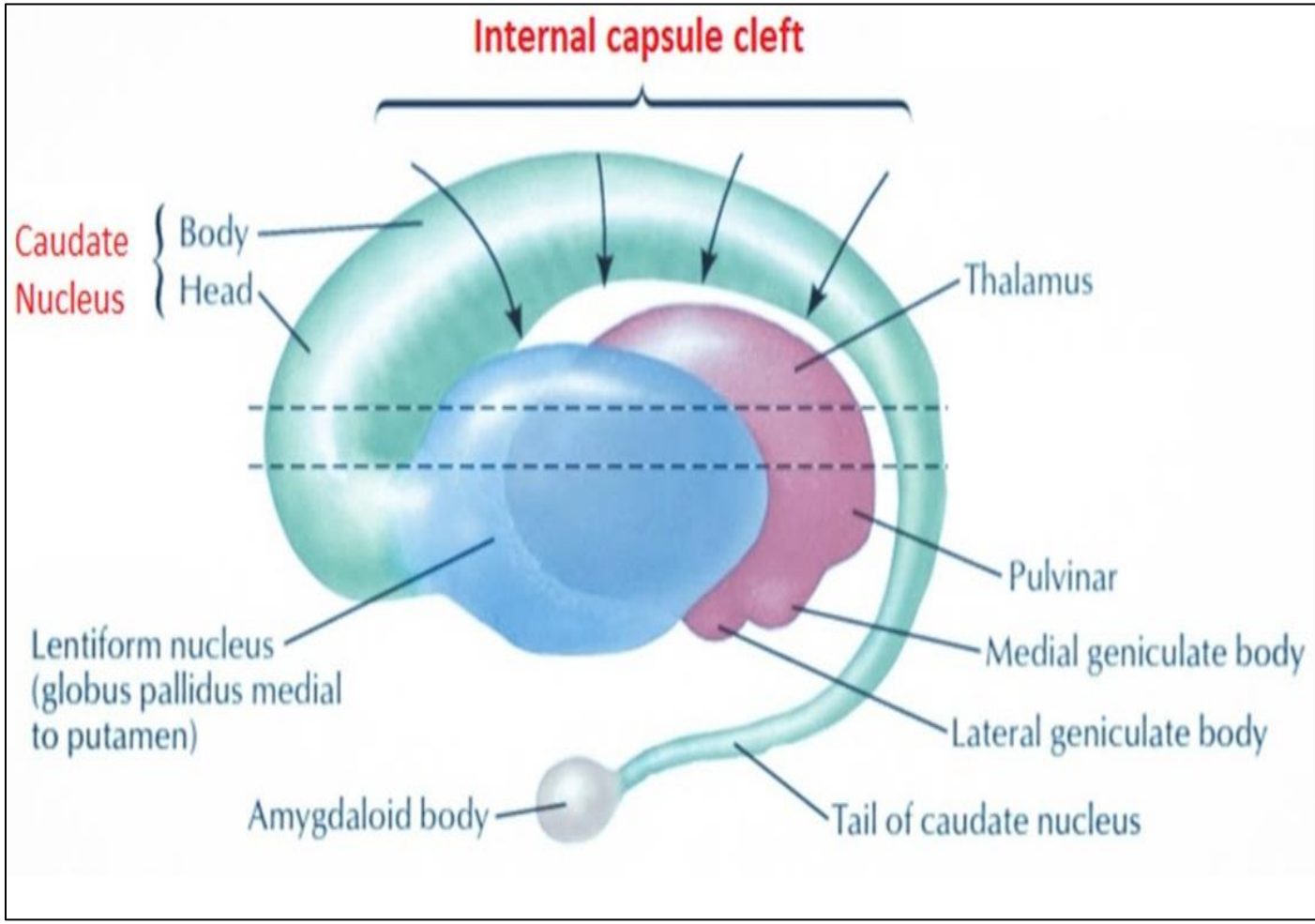
Basal Ganglia

They are composed of:

Corpus Striatum: formed of:

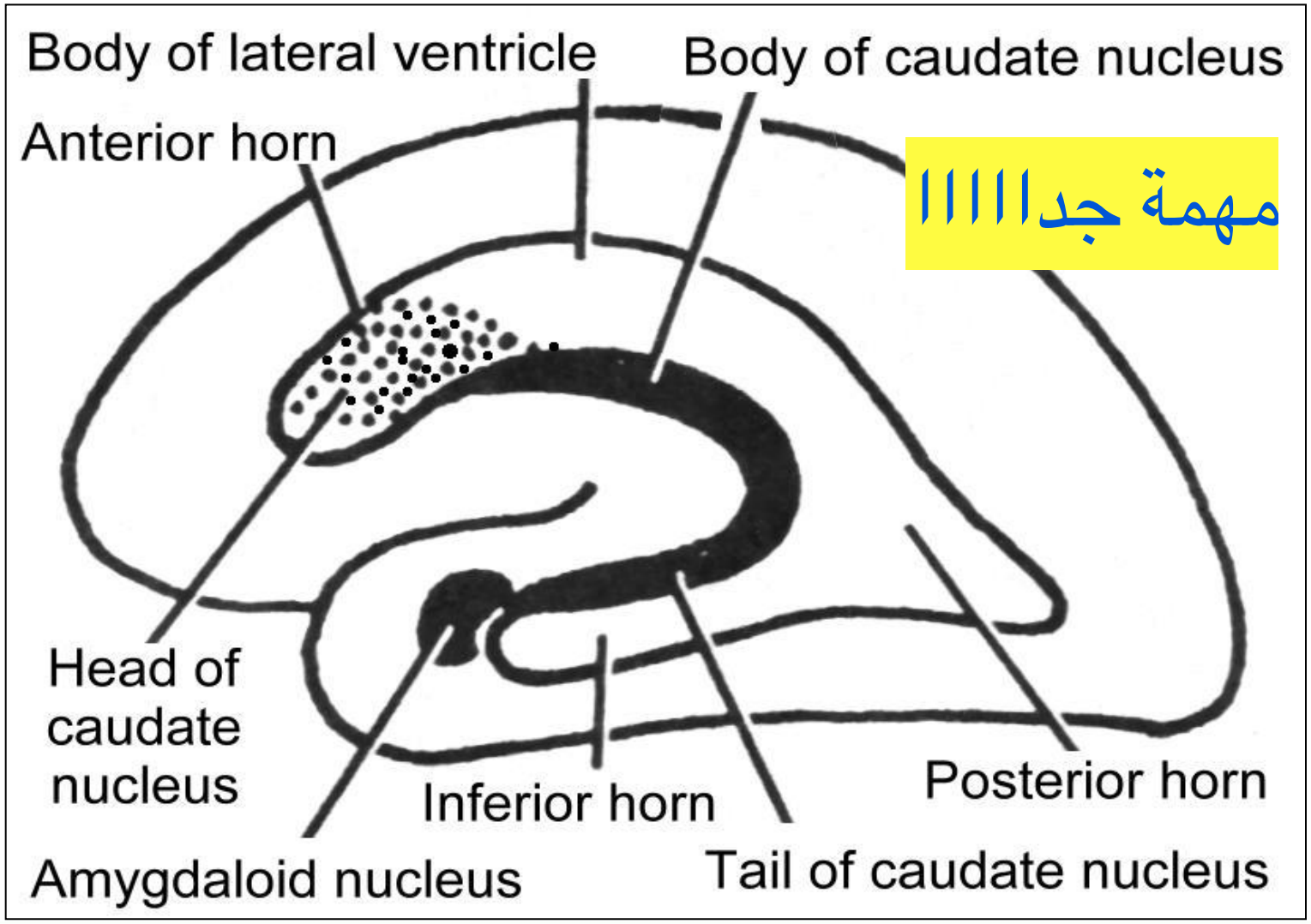
- Caudate nucleus: has
  - ❖ Head.
  - ❖ Body.
  - ❖ Tail.
- Lentiform nucleus: made up of
  - ❑ Globus pallidus (medially)
  - ❑ Putamen (laterally)

- **Amygdaloid nucleus**
- **Claustrum**



Relation of Basal Ganglia to Lateral ventricle

- Head of caudate → Lateral wall of anterior horn.
- Body of caudate → Floor of the body.
- Tail of caudate → Roof of inferior horn.
- Amygdaloid nucleus → Roof of inferior horn.



Horizontal section of the Brain

ده القطع في الصفحة اعلى من اللي جنبه

1. Head of Caudate.
2. Thalamus.
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16. Third ventricle.
17. Tail of caudate + Amygdaloid
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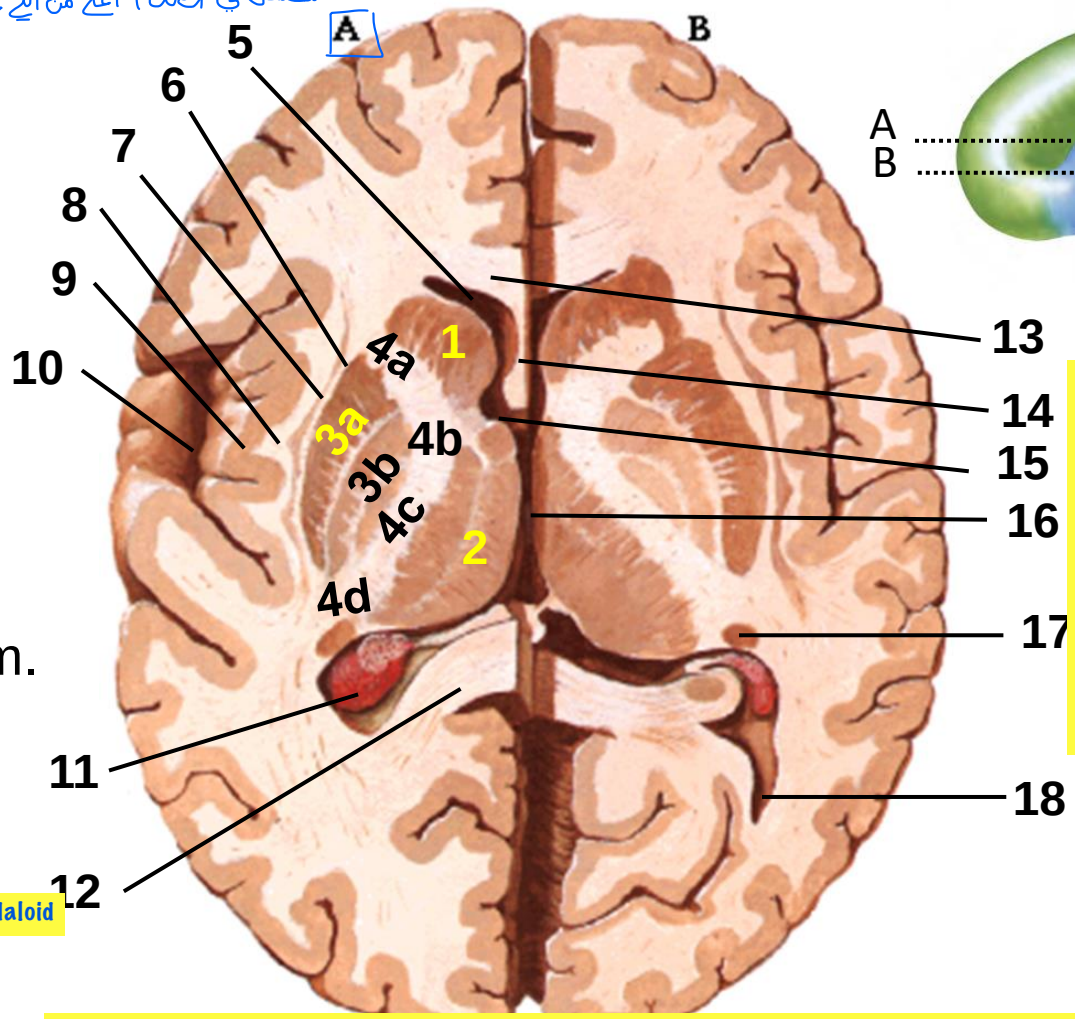

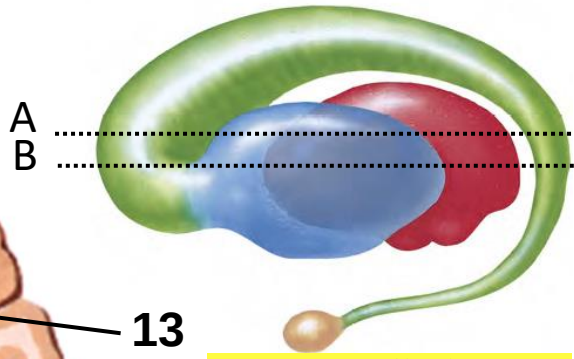

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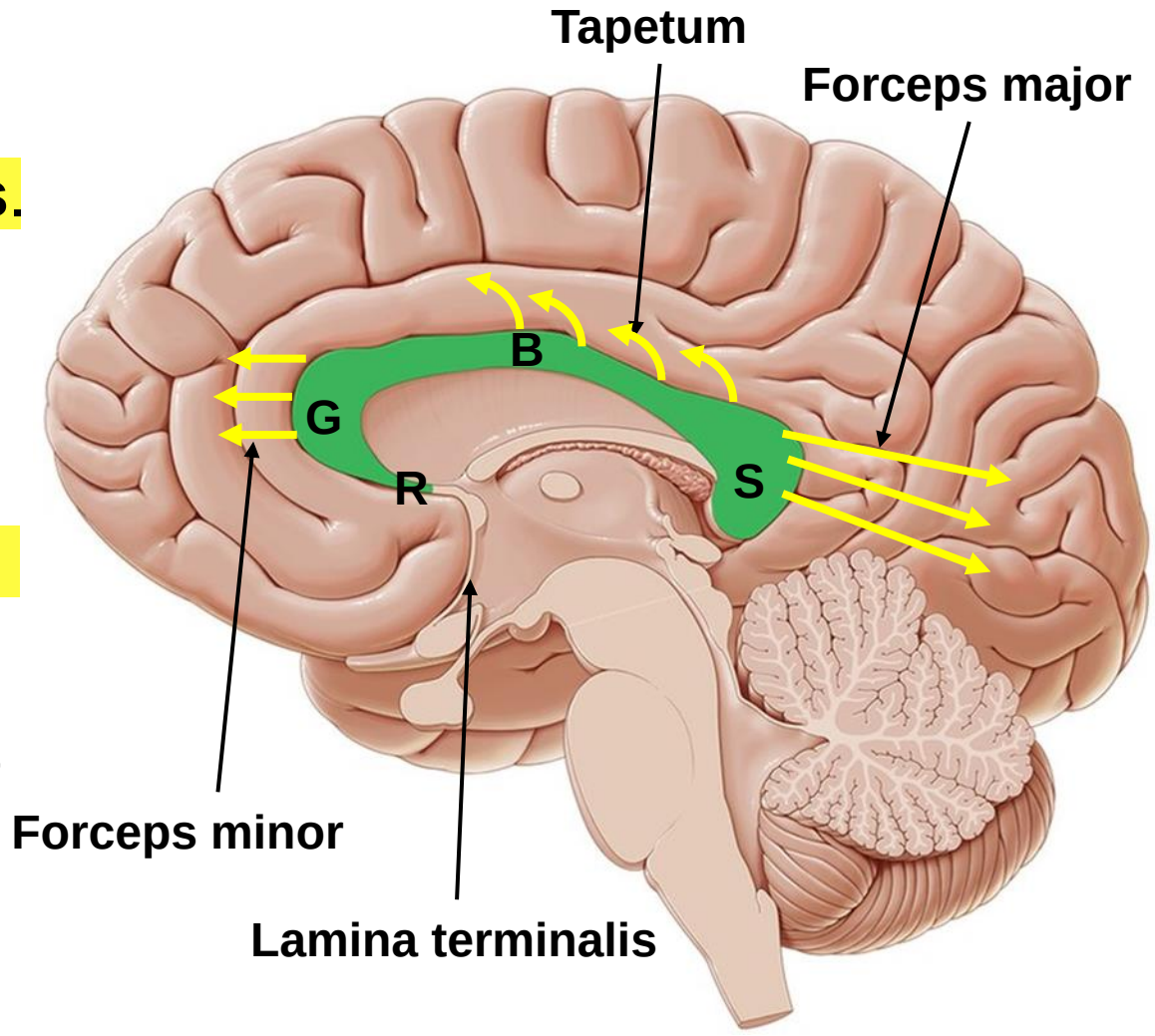
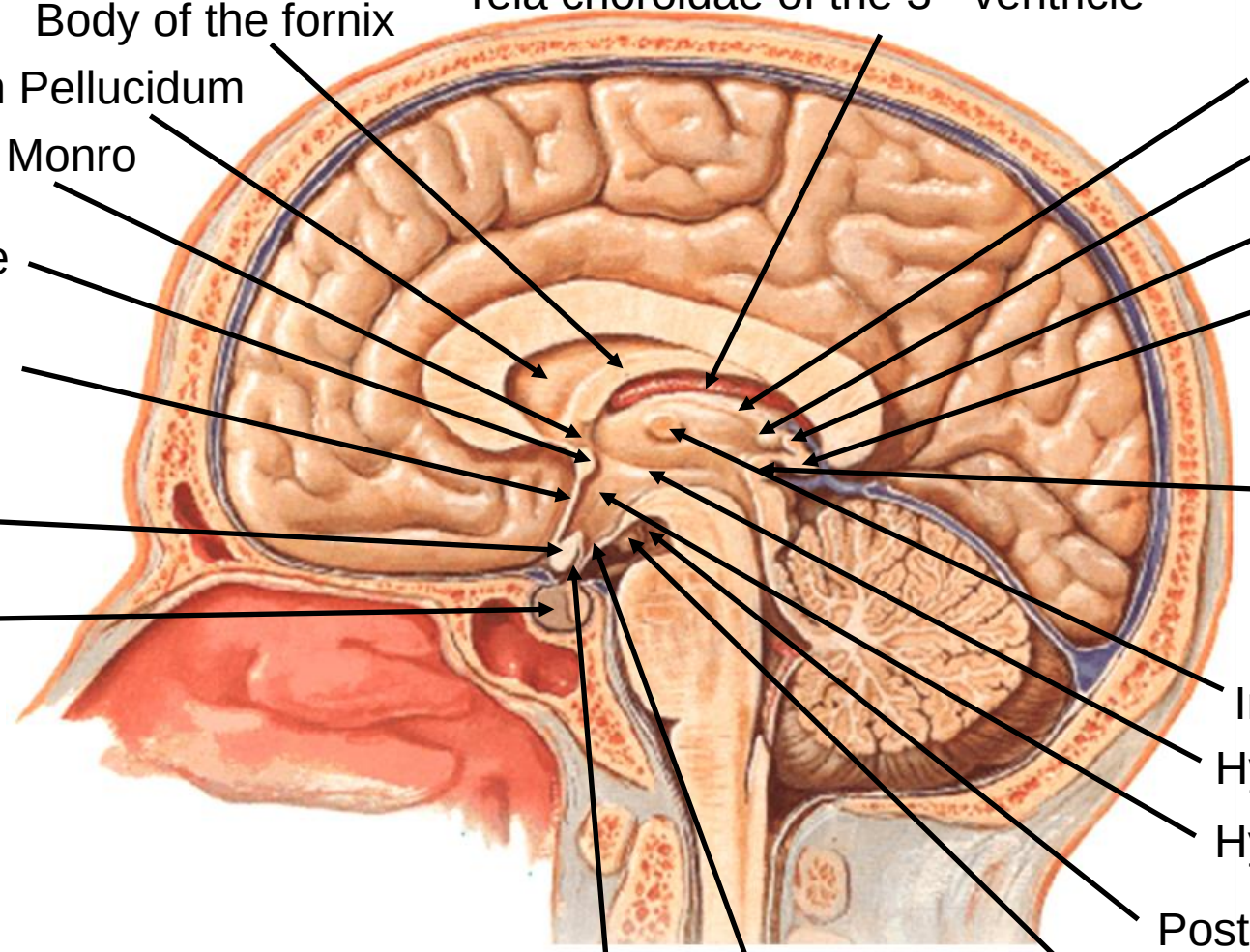


Sagittal section of the Brain



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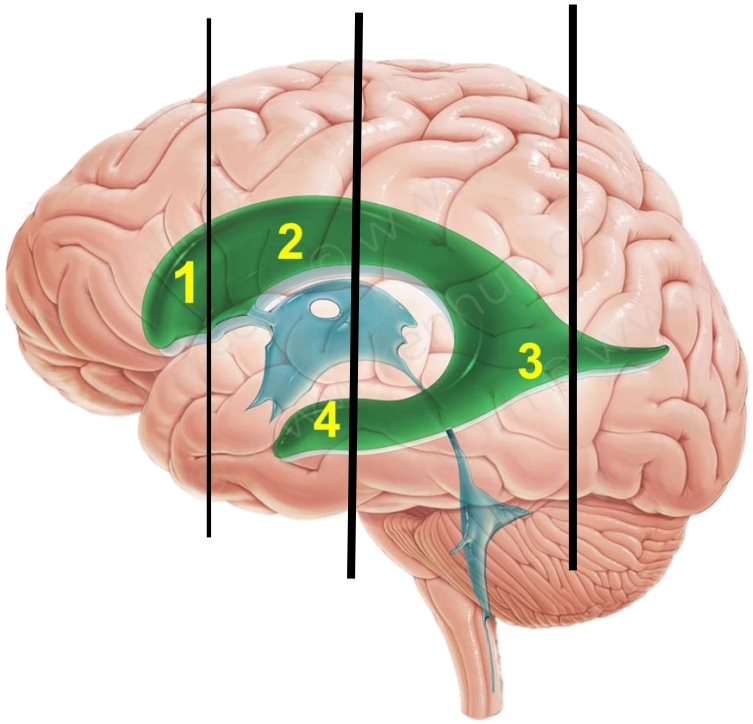
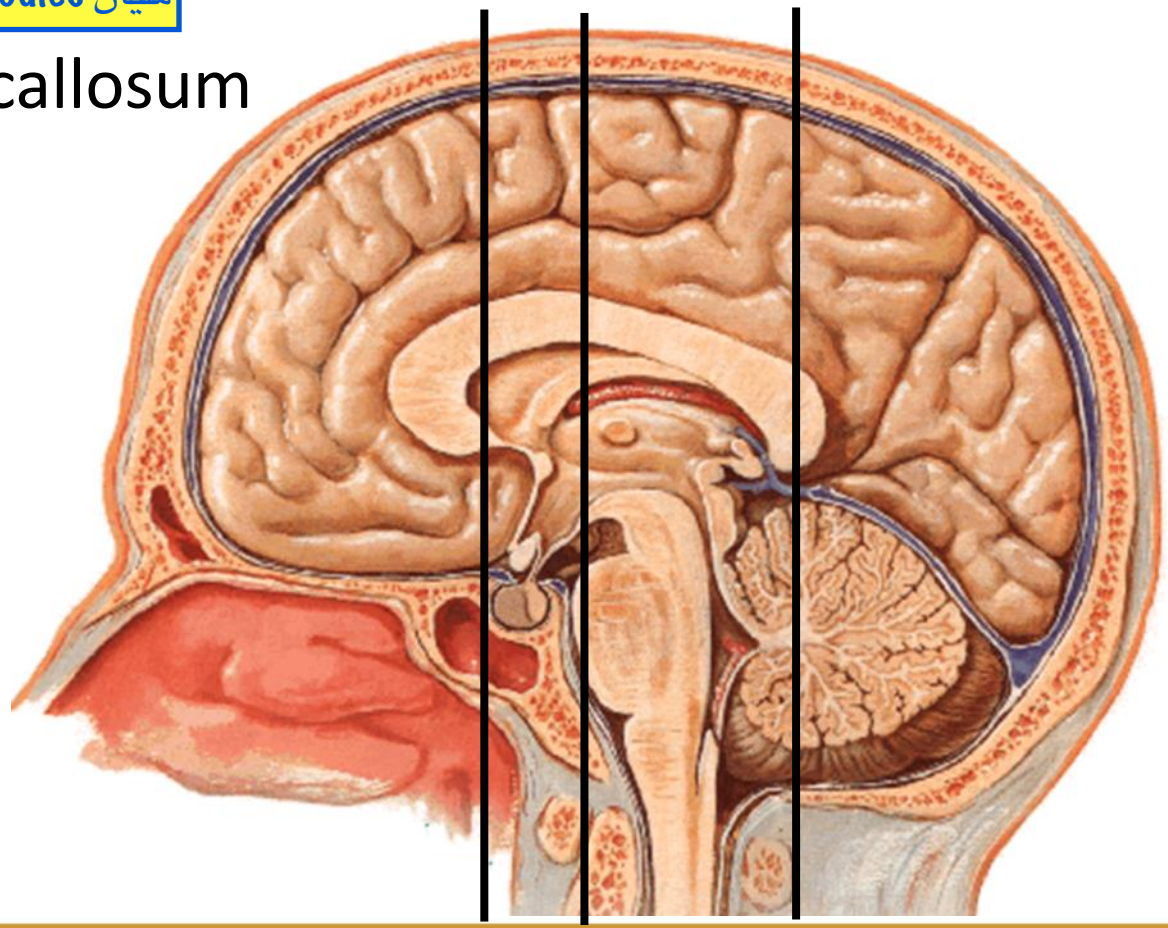
Epithalamus
Interthalamic adhesion
Hypothalamic sulcus
Hypothalamus
Posterior perforated substance
Mamillary bodies
Tuber cinereum
Infundibulum

OSPE : Identify (Any label) ?

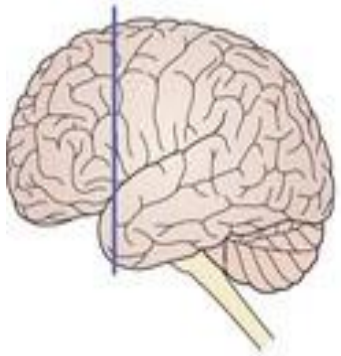
Coronal sections of the Brain

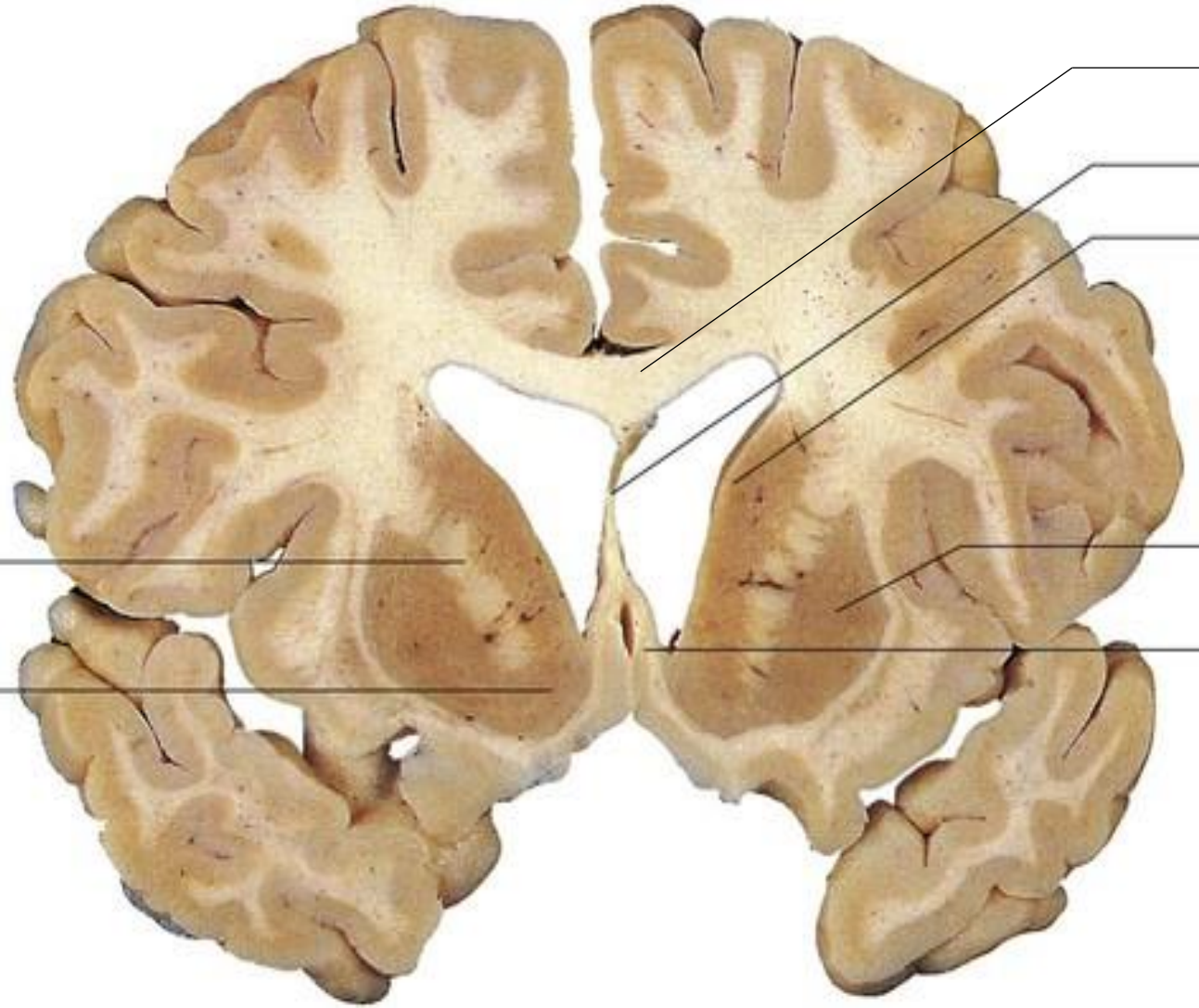
1. At the Rostrum of the Corpus Callosum
2. At the level of the mamillary bodies ← bodies مليان
3. At the level of the splenium of the corpus callosum

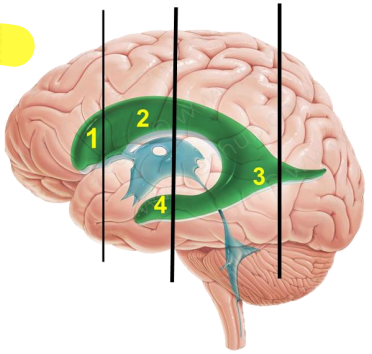


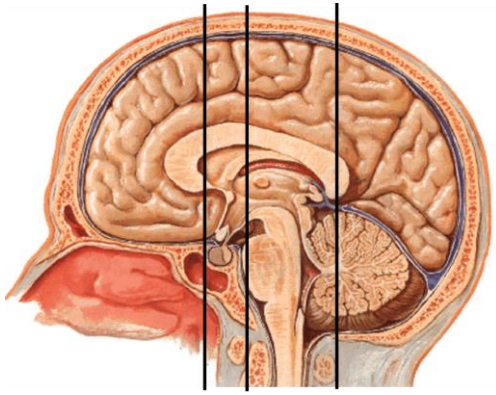


Coronal section at the level of Rostrum









Central part of the Lateral Ventricle

Lies in the parietal lobe

- **Roof:**

1- Corpus callosum (Body).

- **Medial wall:**

2- Septum pellucidum

- **Lateral wall:**

narrow area at the meeting of roof & floor.

- **Floor:**

3- Body of the caudate nucleus .

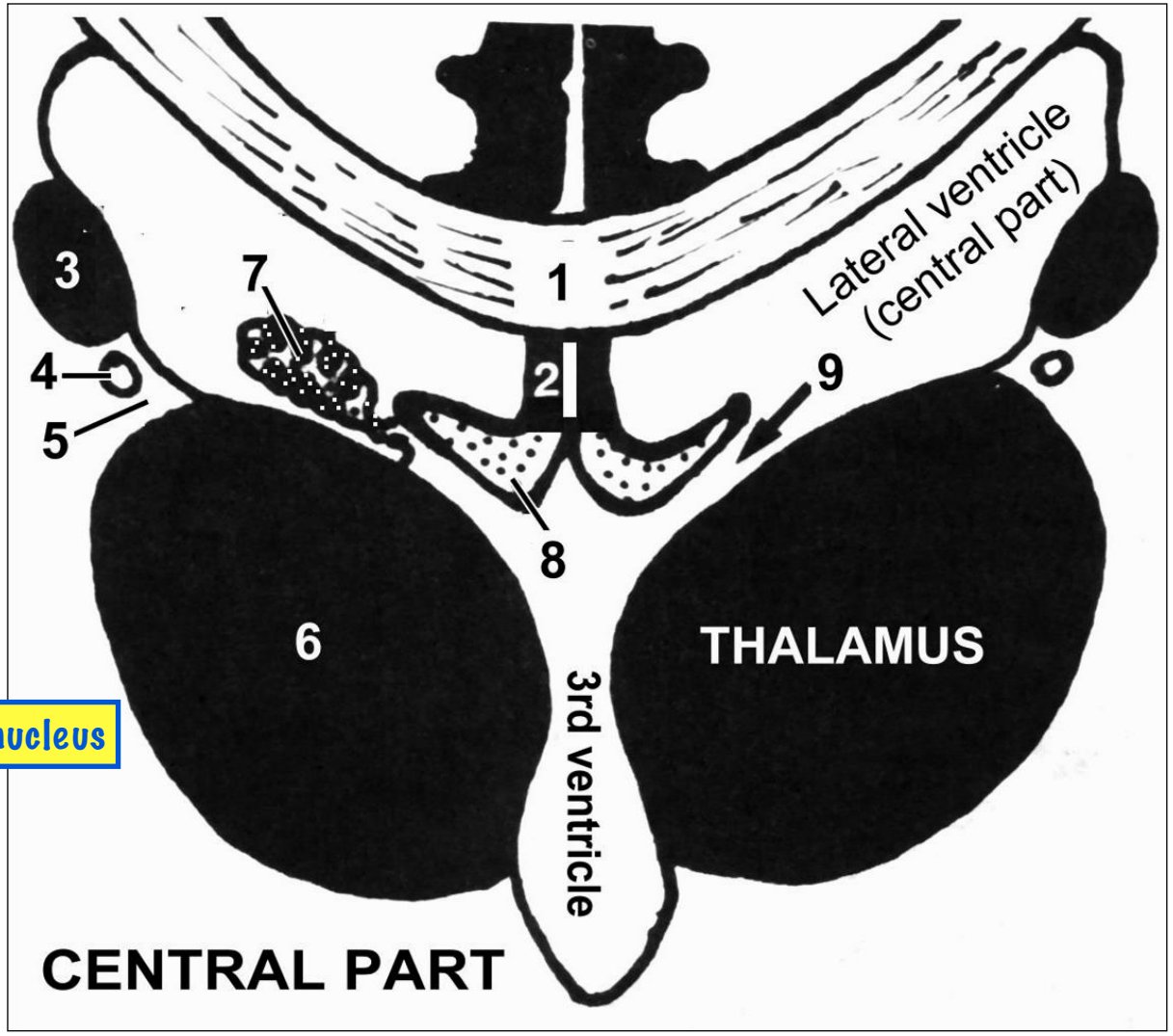
4- Thalamo-striate vein

5- Stria terminalis ← Connect septal area with amygdaloid nucleus

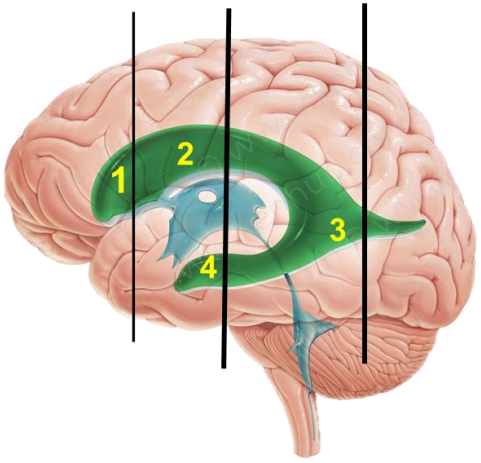
6- Thalamus

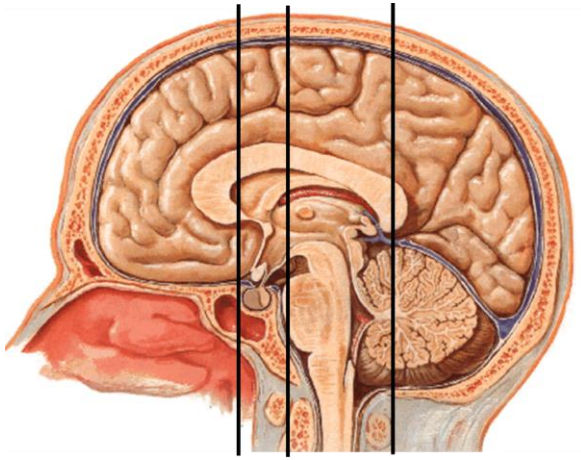
7- Choroid plexus in the choroid fissure

8- Body of the fornix



Coronal section at the level of mamillary bodies

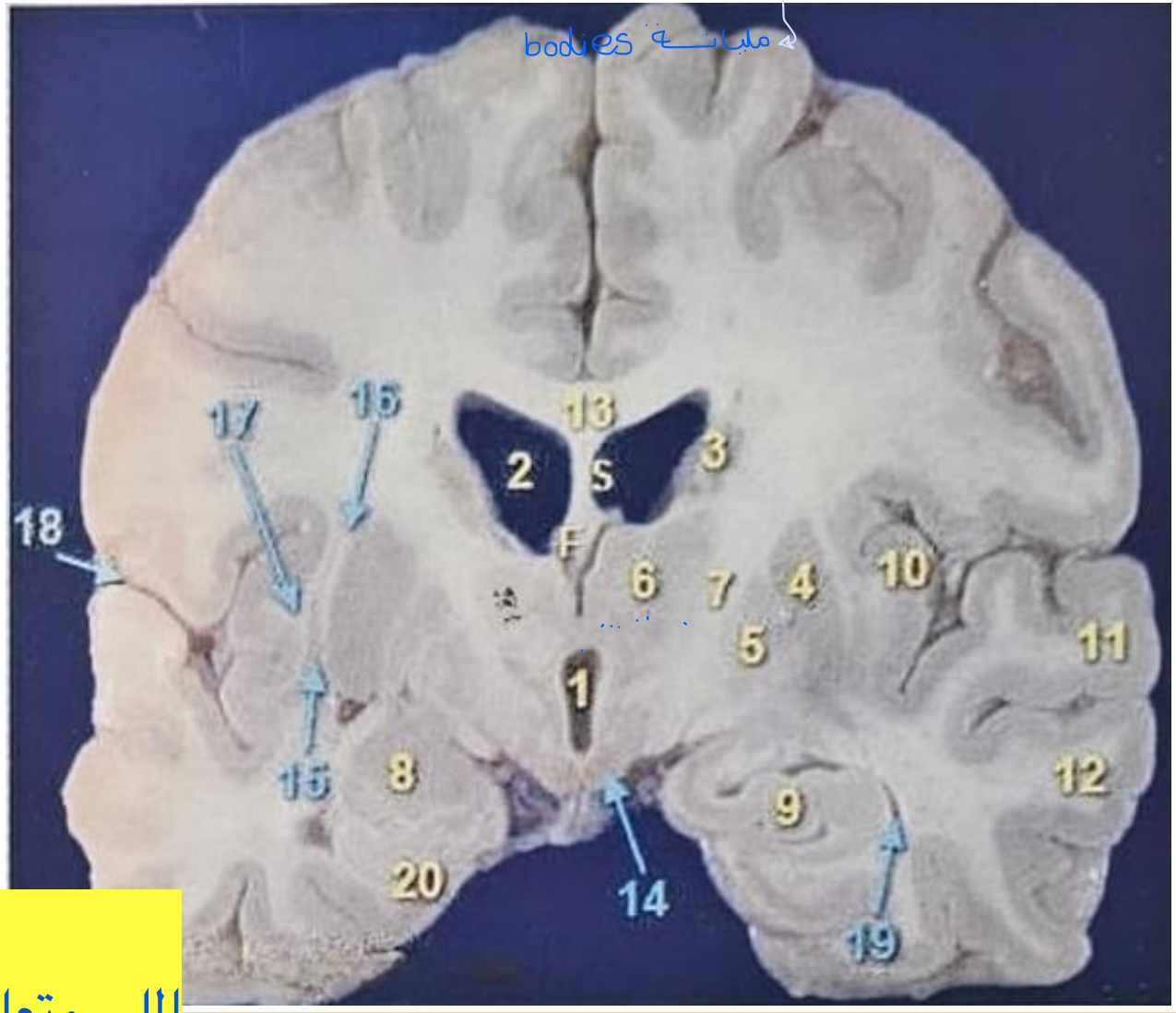




Coronal section at the level of mamillary bodies

bodies ملبانة

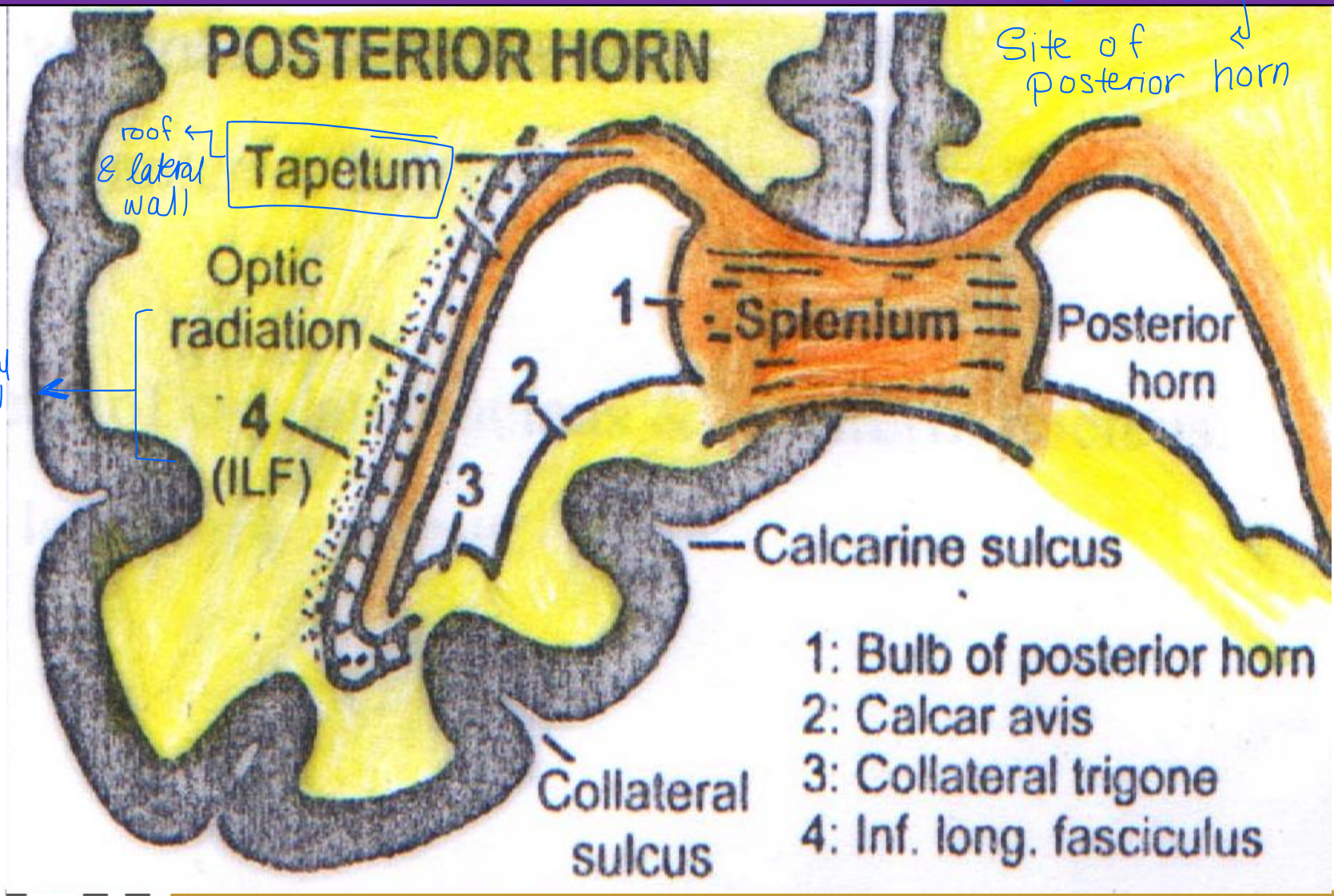
F: Body of the fornix
S: Septum pellucidum
1: Third ventricle.
2: Central part of Lateral Ventricle.
3: Body of caudate nucleus.
4: Putamen.
5: Globus pallidus.
6: Thalamus.
7: Posterior limb of internal capsule.
8: Amygdaloid nucleus.
9: Hippocampus.
10: Insula.
11: Superior Temporal gyrus.
12: Middle temporal gyrus.
13: Corpus Callosum.
14: Mamillary body.
15: Claustrum.
16: External Capsule.
17: Extreme Capsule.
18: Lateral Sulcus.
19: Inferior horn of Lateral ventricle.
20: Parahippocampal gyrus.

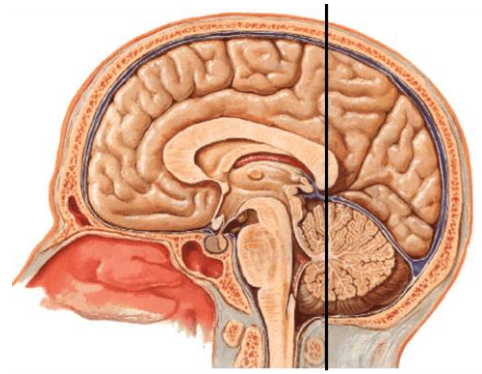


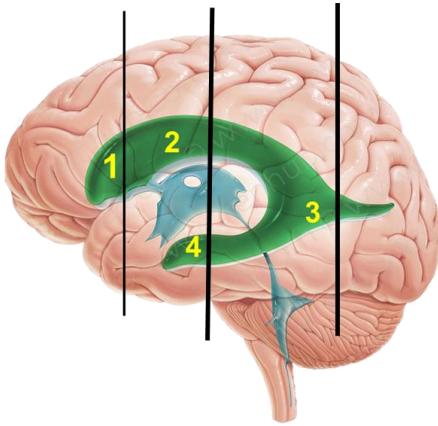
OSPE : Identify (Any label) ?

اللي متعلم عليه بالهايلايت دا الدكتور ركز عليه واحنا مطالبين بكلهم

Coronal section at the level of Splenium







Coronal section at the level of Splenium

1-Splenium of the corpus callosum.

2-Bulb of posterior horn

3-Calcar avis

4-Calcarine sulcus.

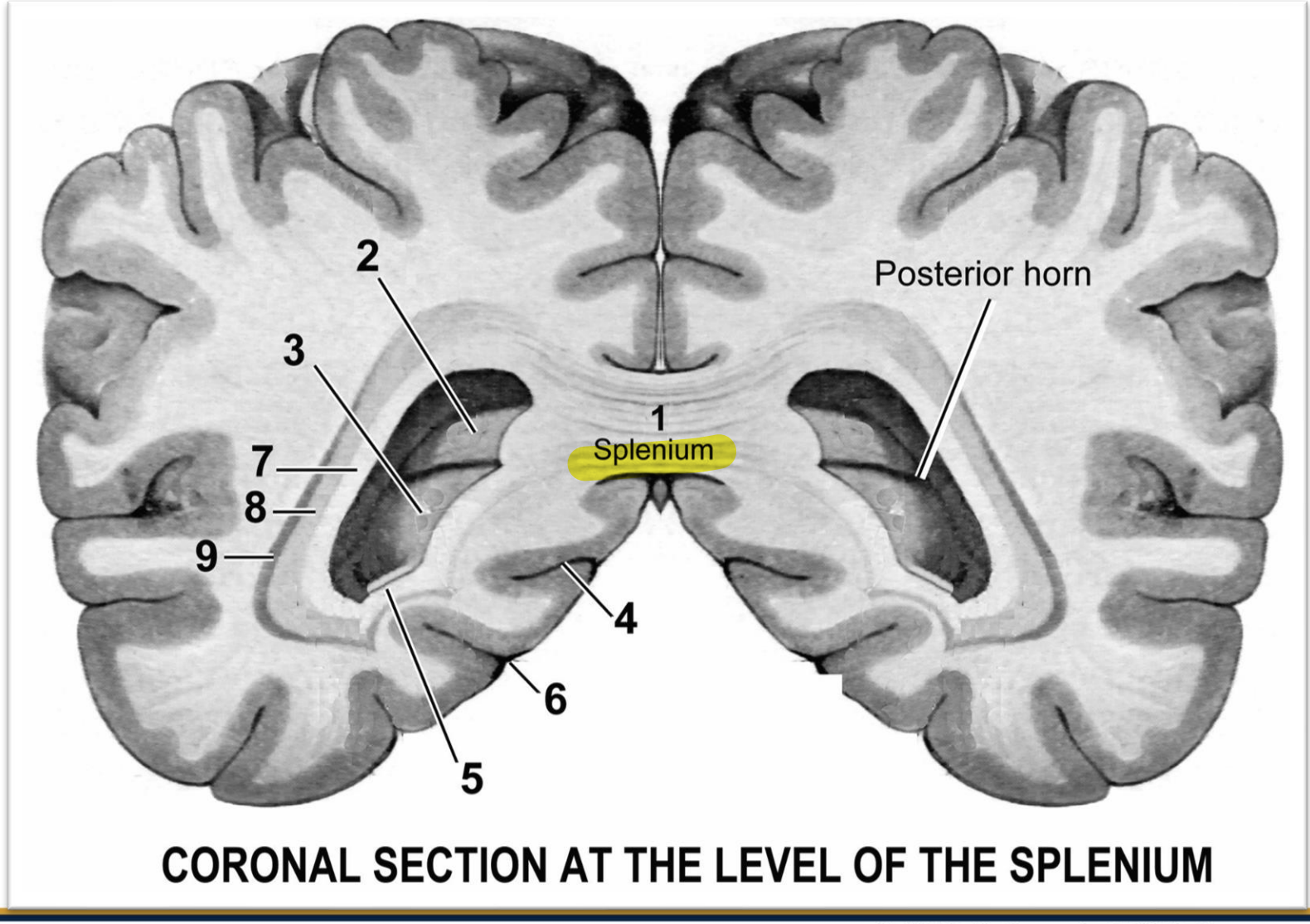
5-Collateral trigone

6-Collateral sulcus.

7-Tapetum of corpus callosum

8-Optic radiation.

9- Inferior Longitudinal Fasciculus



OSPE : Identify (Any label) ?

كلية الطب - جامعة المنصورة الأهلية
Faculty Of Medicine - MANSOURA NATIONAL UNIVERSITY

Anatomy of the skull

Prepared by: Dr. Amal saber

Assistant lecturer of Anatomy & Embryology

OSPE "Very Important Question" :

1- Foramen & canals

2- Structure that pass through each one

The Skull

- The skull may be viewed from the following aspects **(Norma):**

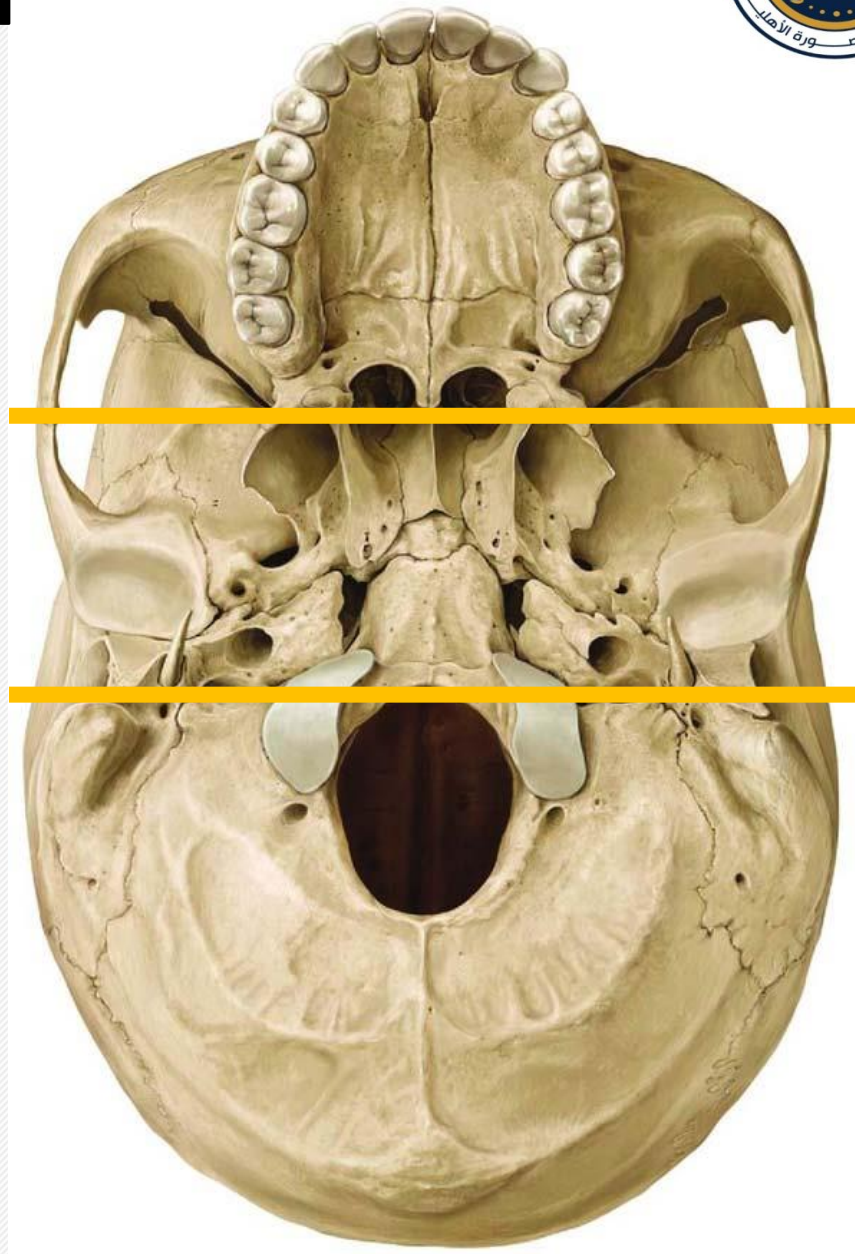
1. Above (Norma verticals)
2. Behind (Norma occipitalis)
3. Front (Norma frontalis)
4. Side (Norma lateralis)
5. Base of skull (Norma basalis)

Norma basalis Externa

Anterior part
(Hard palate & teeth)

middle part
(from the hard palate to the anterior margin of foramen magnum)

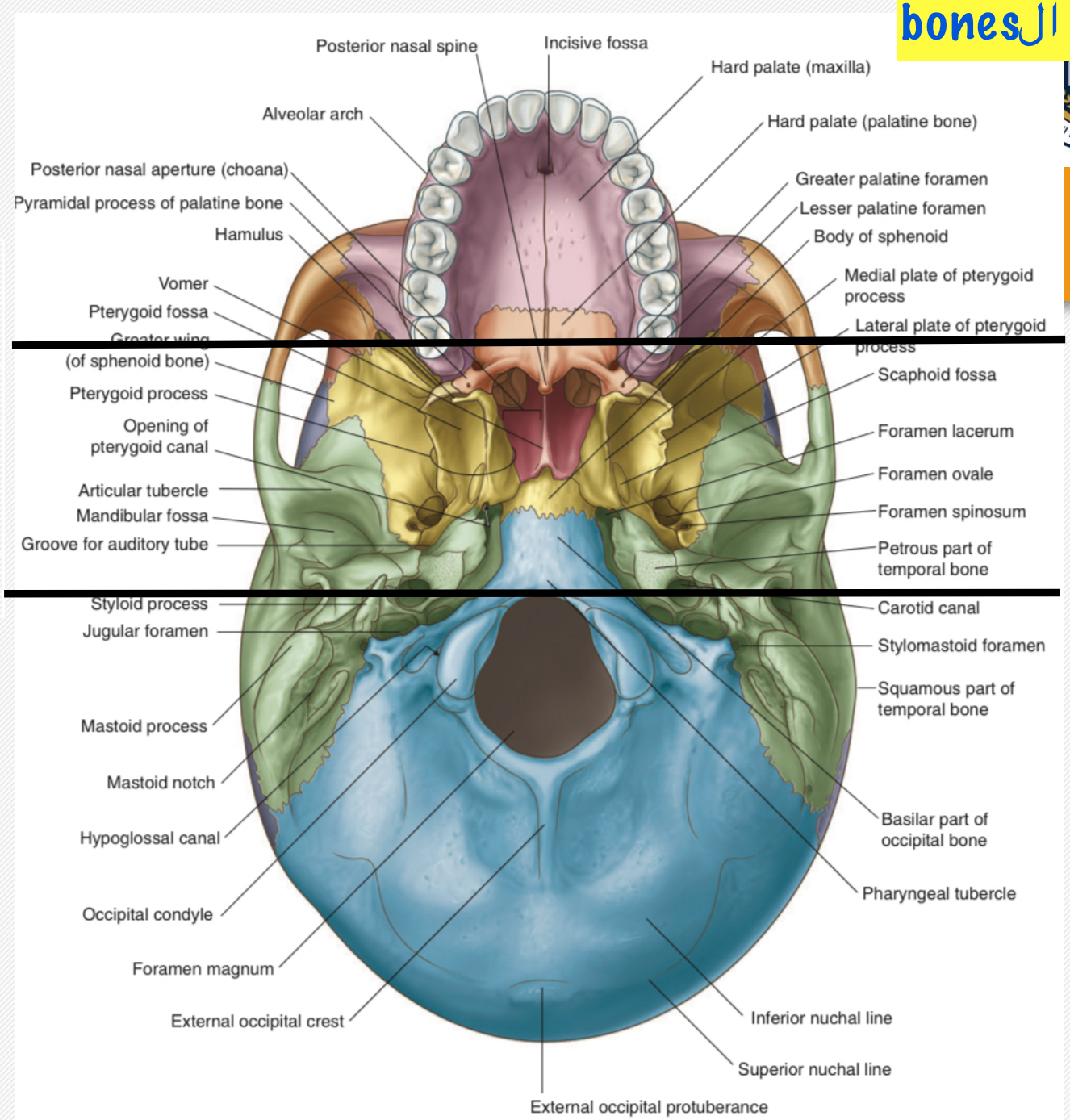
Posterior part
(from the anterior margin of the foramen magnum to the superior nuchal lines)



Bones

نركز على الbones

- Maxilla
- Palatine
- Vomer
- Sphenoid
- Temporal
- Occipital



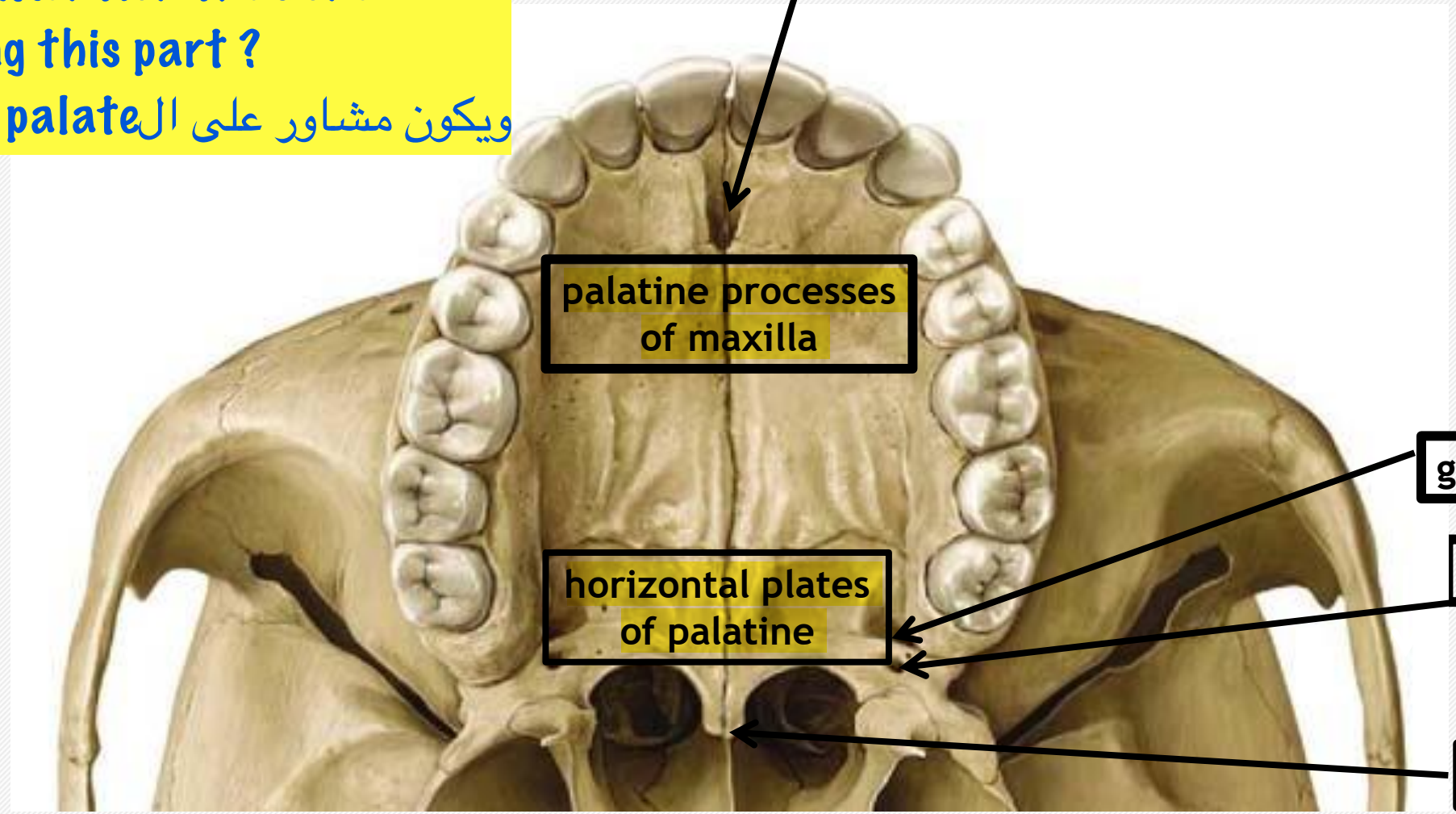
* N.B : Sphenoid (3parts)

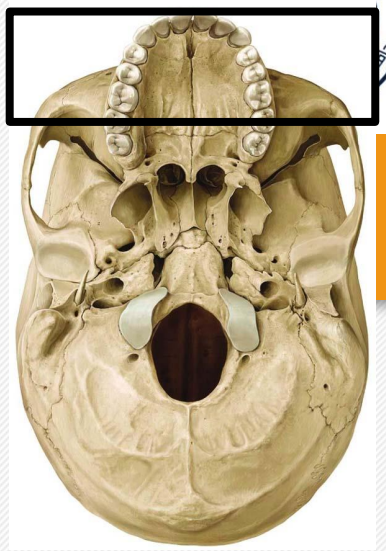
Body — Greater wing — Lesser wing (لأنها شوكة من جوا)

Ant. Part

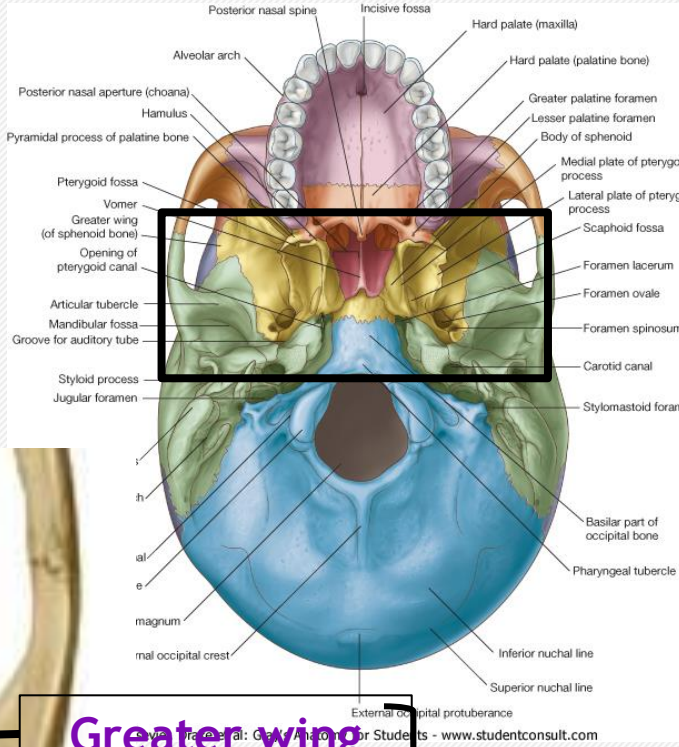
OSPE : Mention the bone forming this part ?

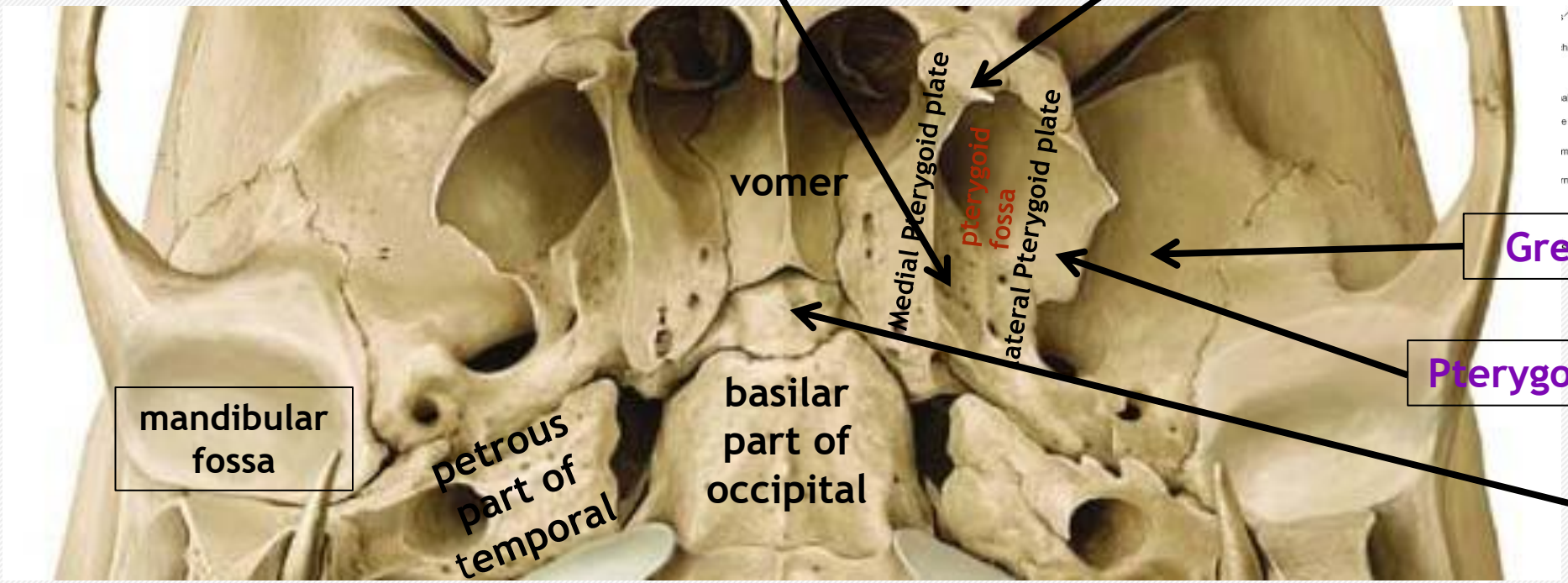
ويكون مشاور على الHard palate





Middle part





!! ال middle part مهم جدااا

Middle part

Foramina

!! مهم جدا middle part ال

Structure that pass through :

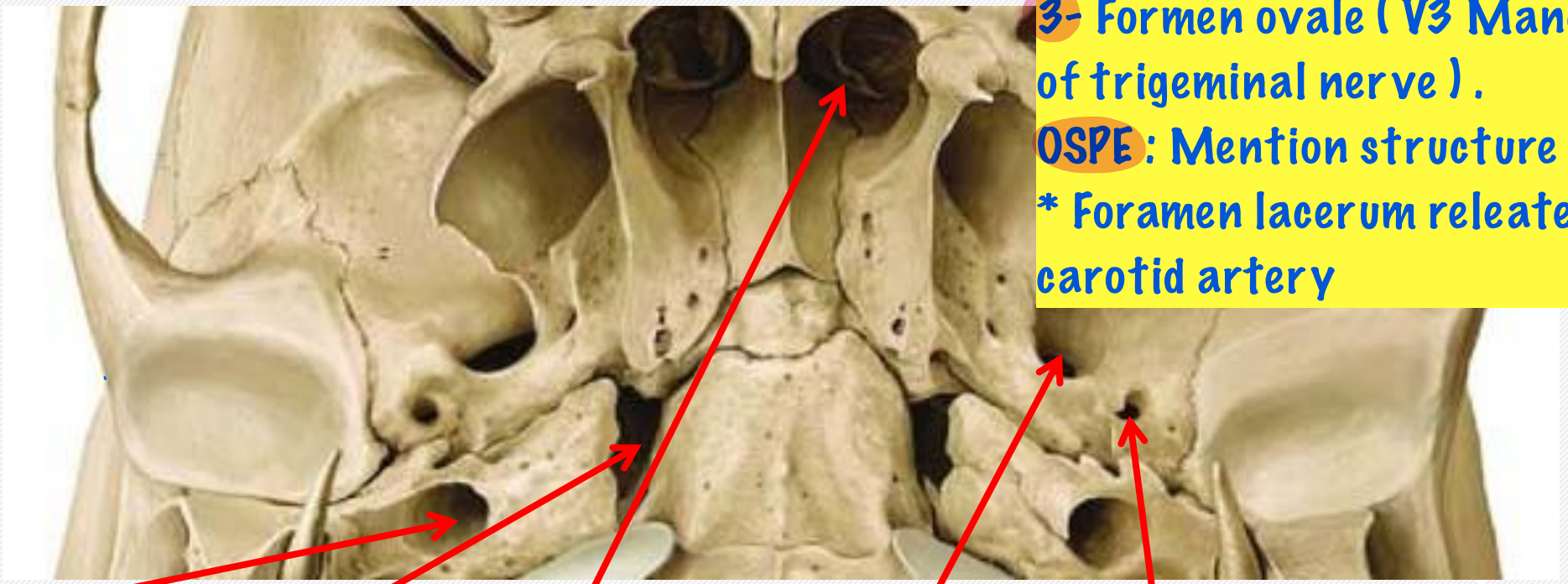
1- Foramen spinosum (Nervous spinosum)

2- Carotid canal (Internal carotid artery)

3- Formen ovale (V3 Mandibular division of trigeminal nerve) .

OSPE : Mention structure passing through .. ?

* Foramen lacerum releated to Internal carotid artery



Carotid canal

foramen lacerum

Posterior nasal aperture (choana)

Posterior nasal opening

Foramen ovale

Foramen spinosum

Post. part

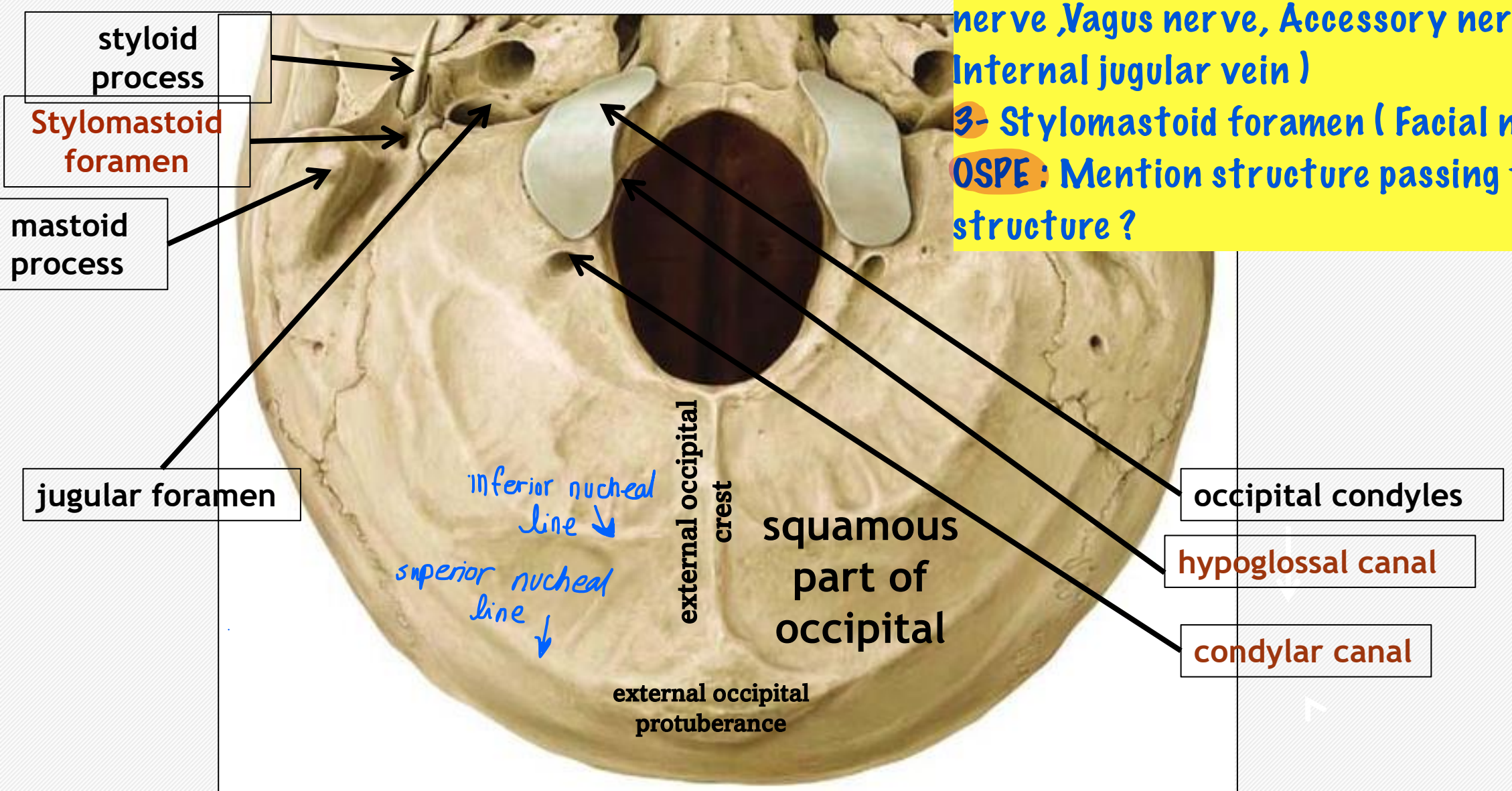
Structure that pass through :

1- hypoglossal canal (hypoglossal nerve)

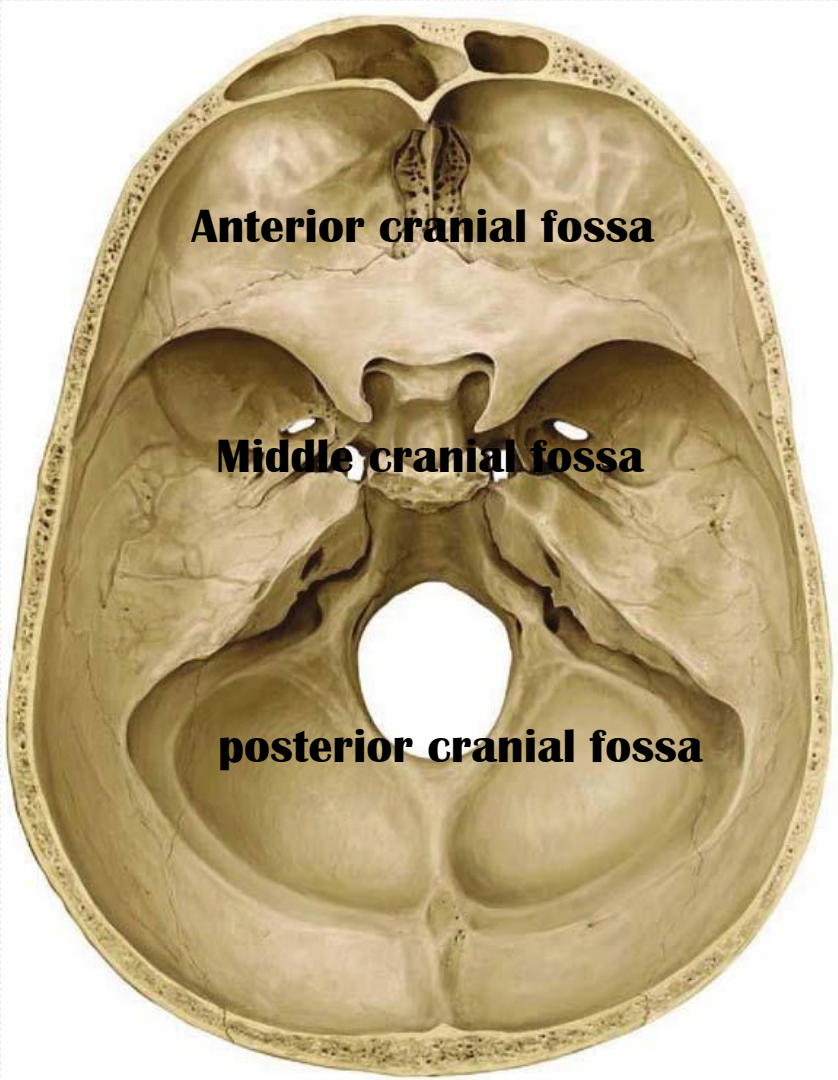
2- Jugular foramen (Glossopharyngeal nerve ,Vagus nerve, Accessory nerve & Internal jugular vein)

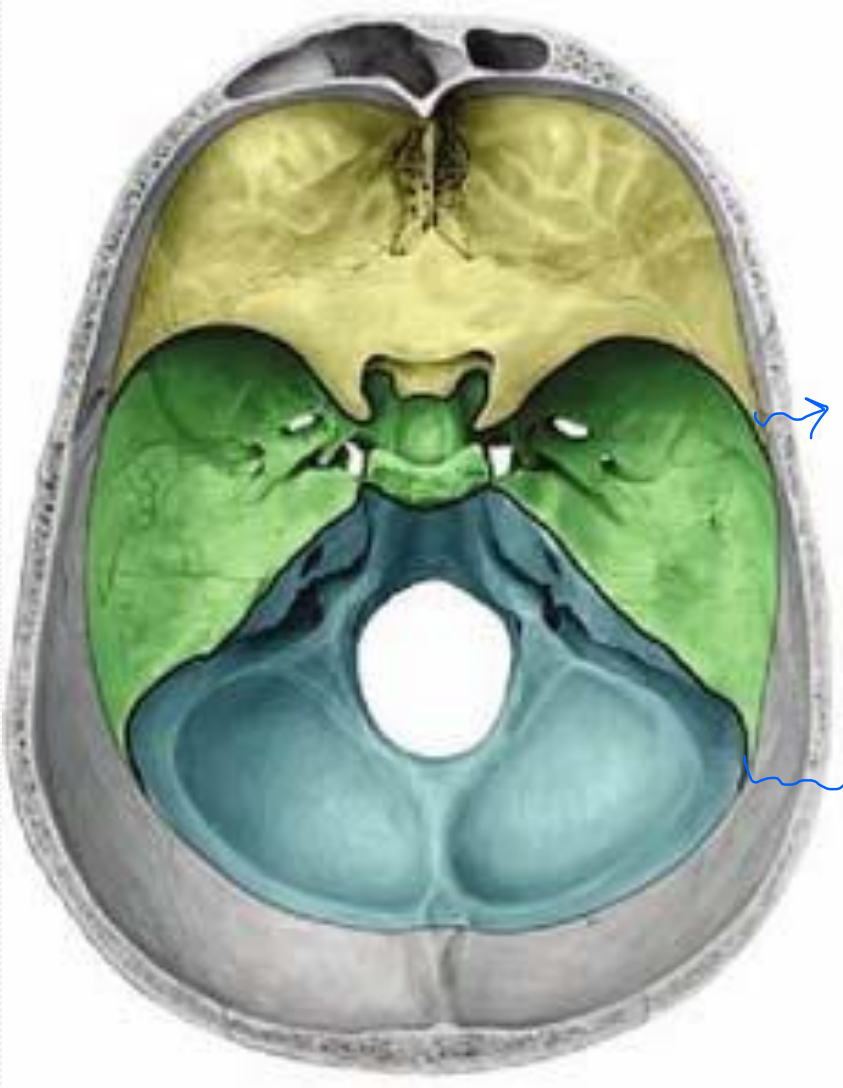
3- Stylomastoid foramen (Facial nerve)

OSPE : Mention structure passing through this structure ?



Cranial cavity
(Norma Basalis Interna)



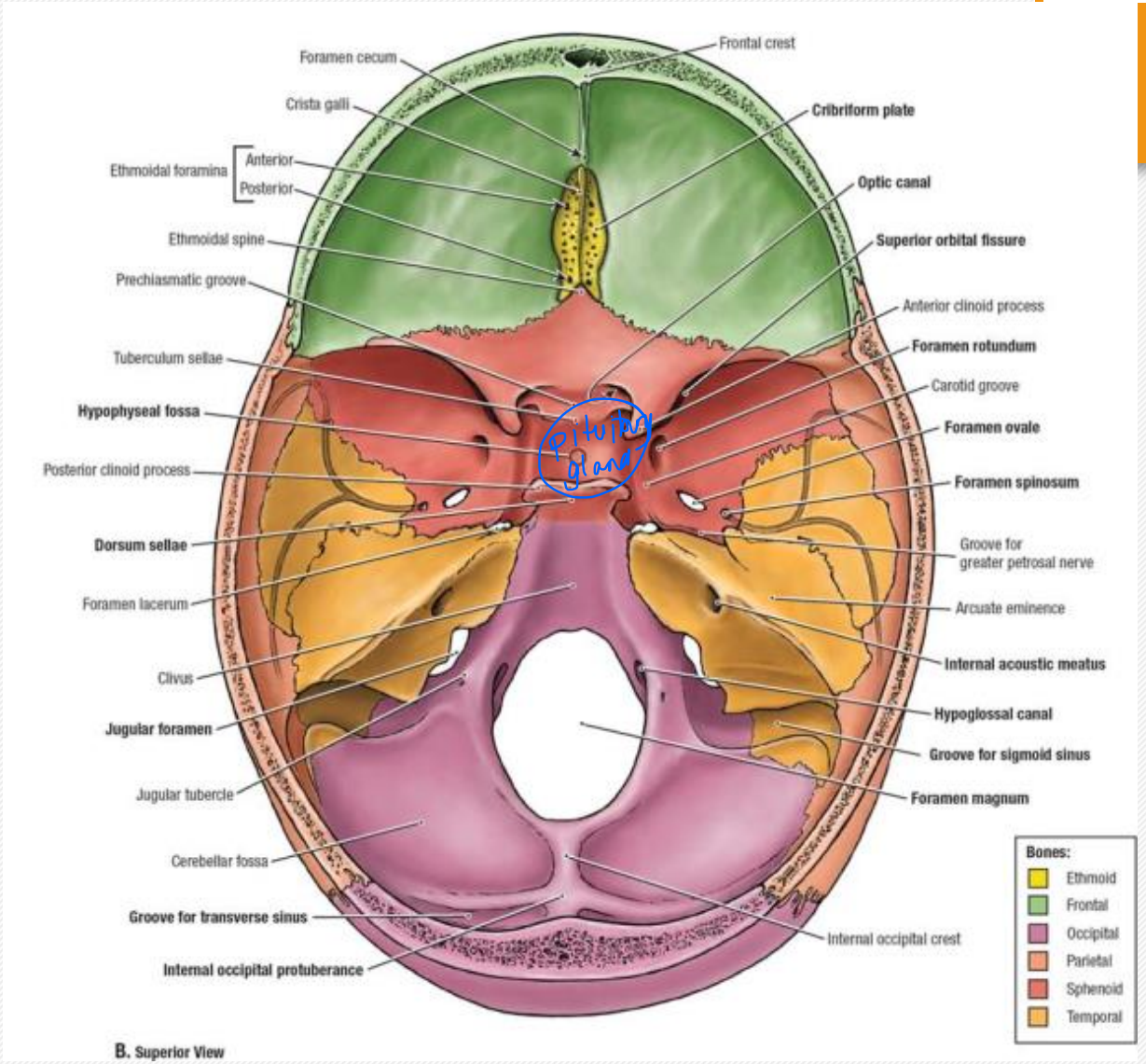


separated by: Lesser wing

separated by: pterous edge

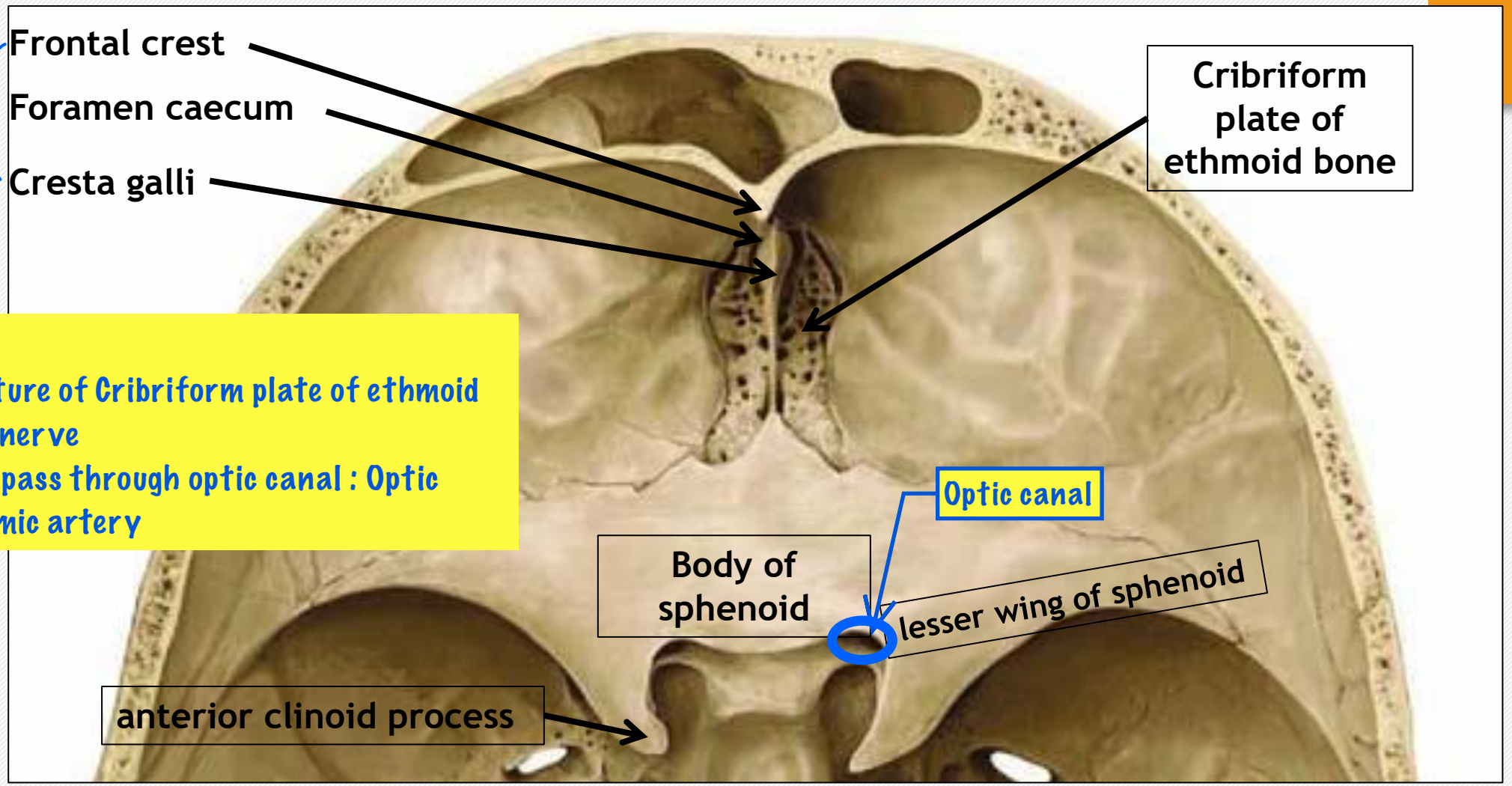
Bones

	Frontal
	Ethmoid
	Sphenoid
	Temporal
	Occipital



B. Superior View

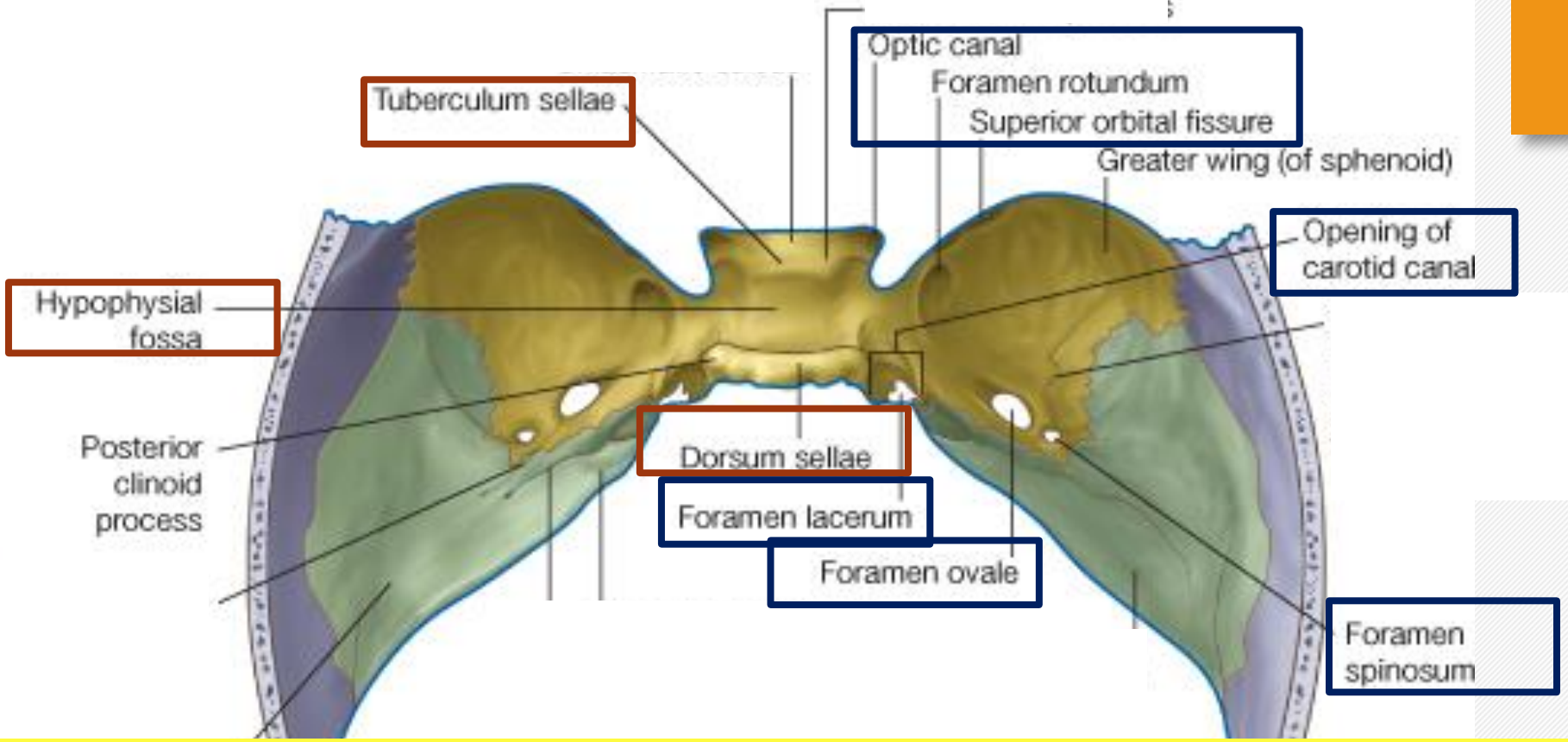
Anterior cranial fossa



OSPE مهم :

- Releated structure of Cribriform plate of ethmoid bone : Olfactory nerve
- Structure that pass through optic canal : Optic nerve & Ophthalmic artery

Middle cranial fossa



Structure that pass through :

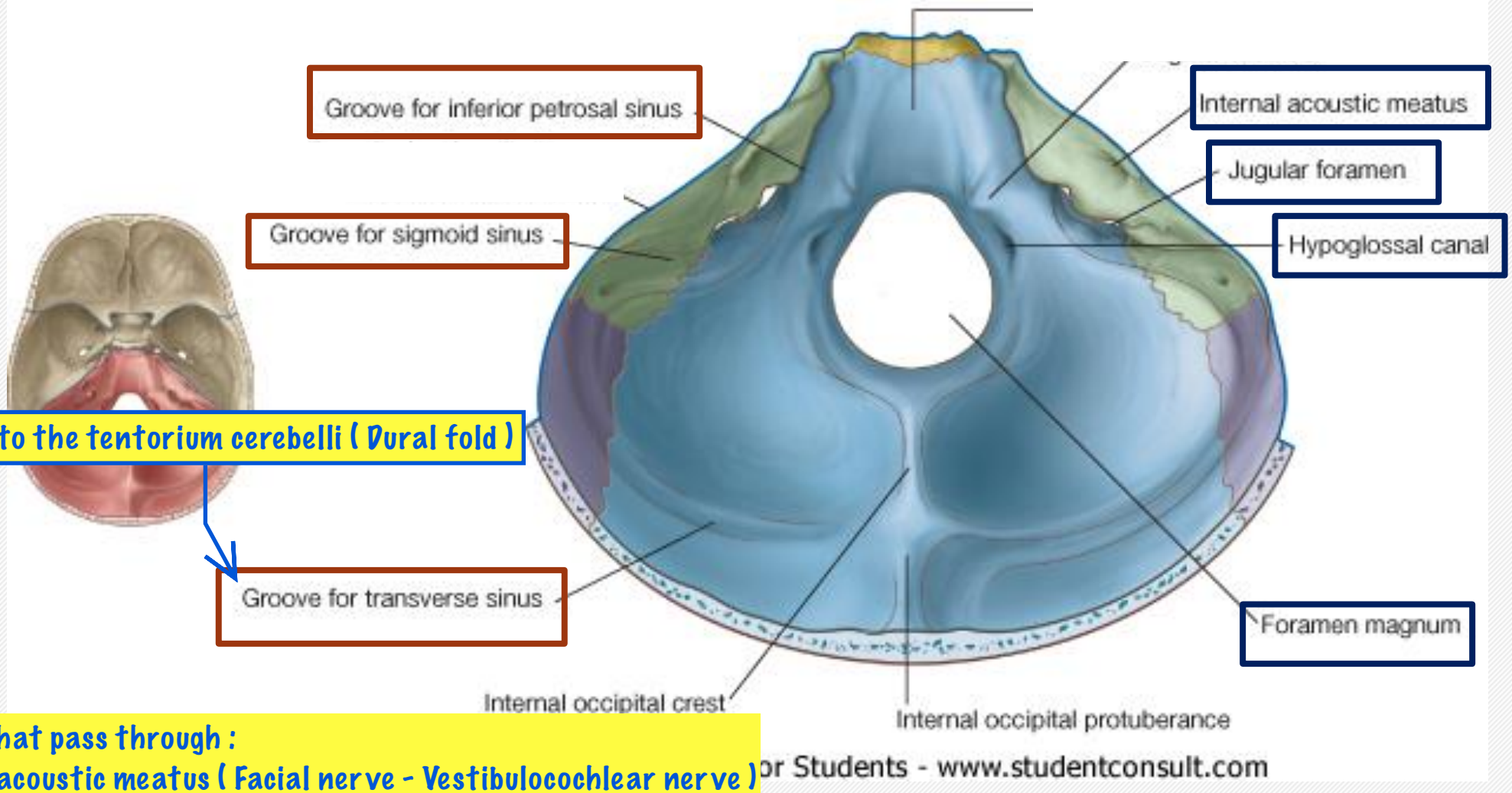
1- Foramen rotundum (Maxillary division of trigeminal nerve)

2- Superior orbital fissure (V1 Ophthalmic division of trigeminal nerve - Oculomotor nerve - Trochlear nerve - Abducent nerve)

OSPE : Mention structure passing through this structure ?

* Structure releated to hypophysial fossa : Pituitary gland

Posterior cranial fossa



Structure that pass through :

1- Internal acoustic meatus (Facial nerve - Vestibulocochlear nerve)

2- Foramen magnum (Spinal cord - Vertebral arteries)

OSPE : Mention structure passing through this structure ?

بالنسبة للسكشن دا الدكتورة ركزت على :

1- Identify these suture ?

2- Enumerate bones forming these parts (Pterion - Asterion) ?

Anatomy of the skull

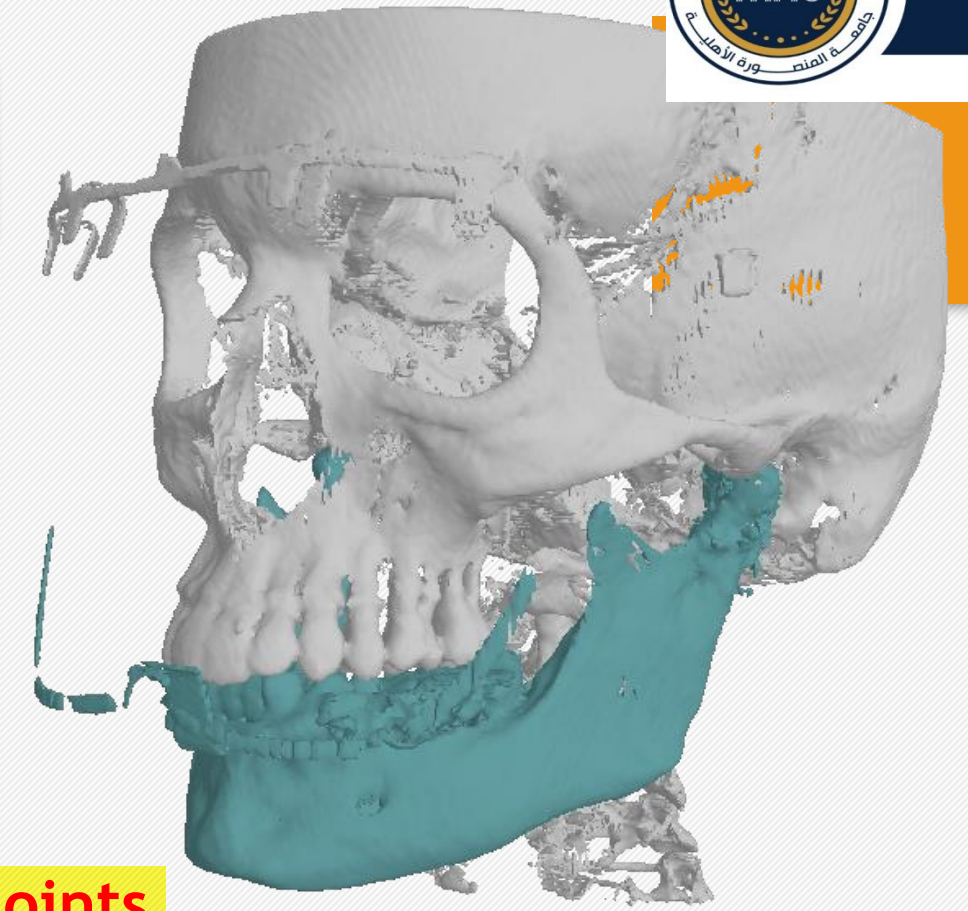
Prepared by: Dr Dina Abdallah Badawi

Demonstrator of Anatomy & Embryology

Dr Noura Magdy Abo Elkhair

Assistant lecturer of Anatomy & Embryology

The Skull



-The skull is the skeleton of the head and is mainly formed of two parts:

- ❑ The cranium.
- ❑ The mandible.

-The cranial bone are united together by sutural joints.

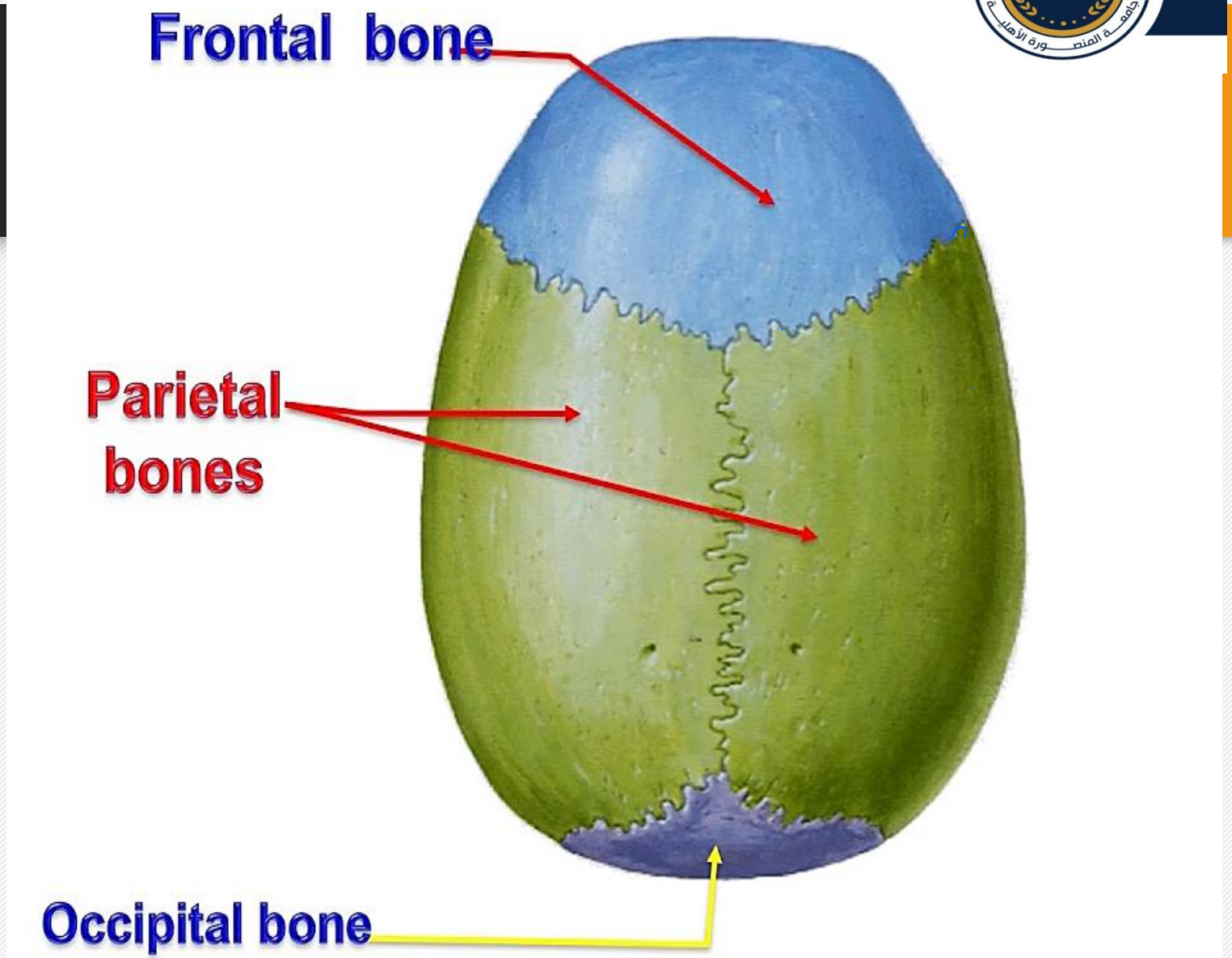
The Skull

- The skull may be viewed from the following aspects **(Norma):**

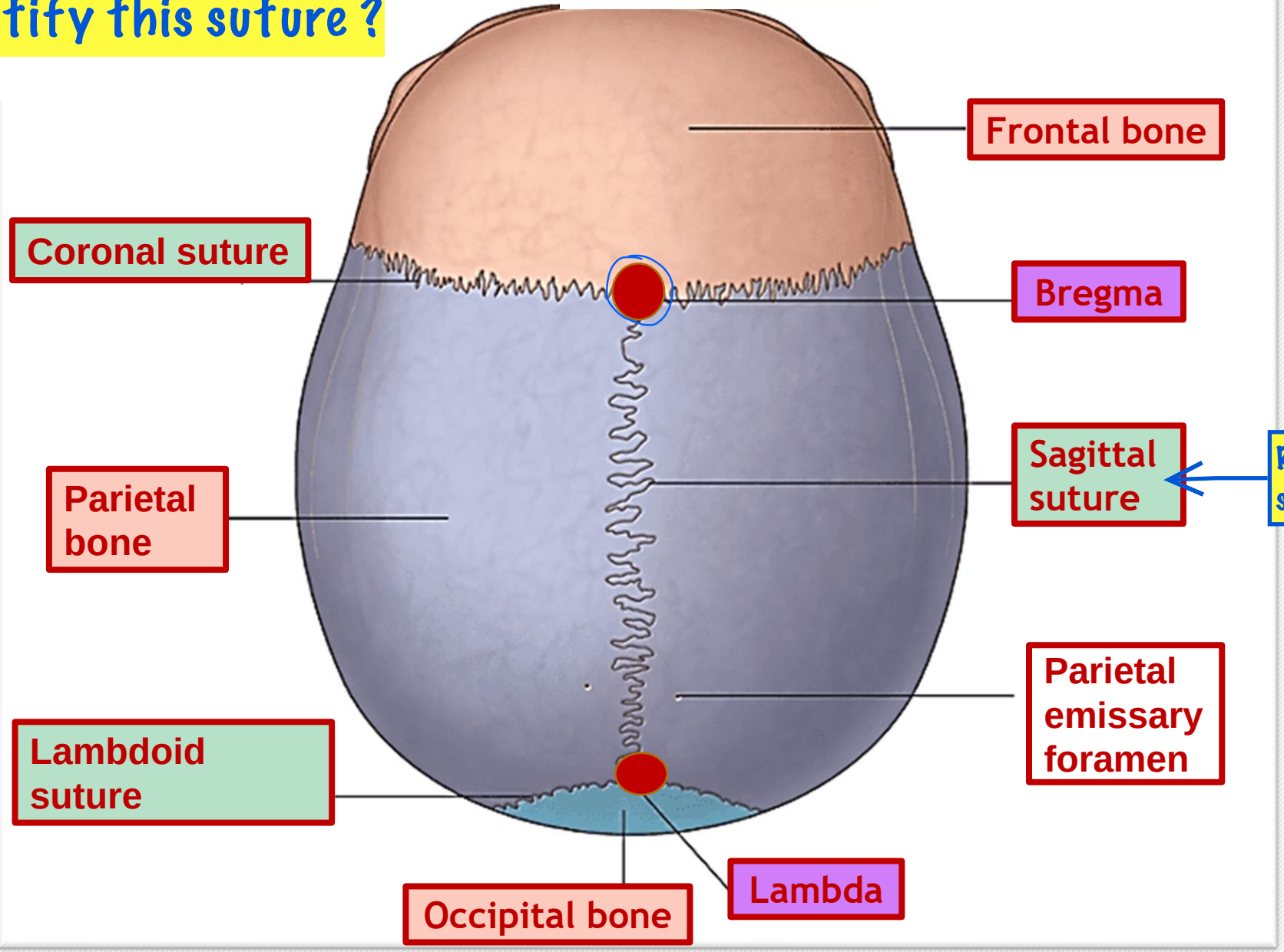
1. Above (Norma verticals)
2. Behind (Norma occipitalis)
3. Front (Norma frontalis)
4. Side (Norma lateralis)
5. Base of skull (Norma basalis)

Norma Verticalis

- It is the upper aspect (Vault of the skull).
- Bones Forming it:
  1. Frontal bone (anteriorly)
  2. 2 parietal bones (on each side)
  3. Occipital bone (posteriorly)



OSPE : Identify this suture ?



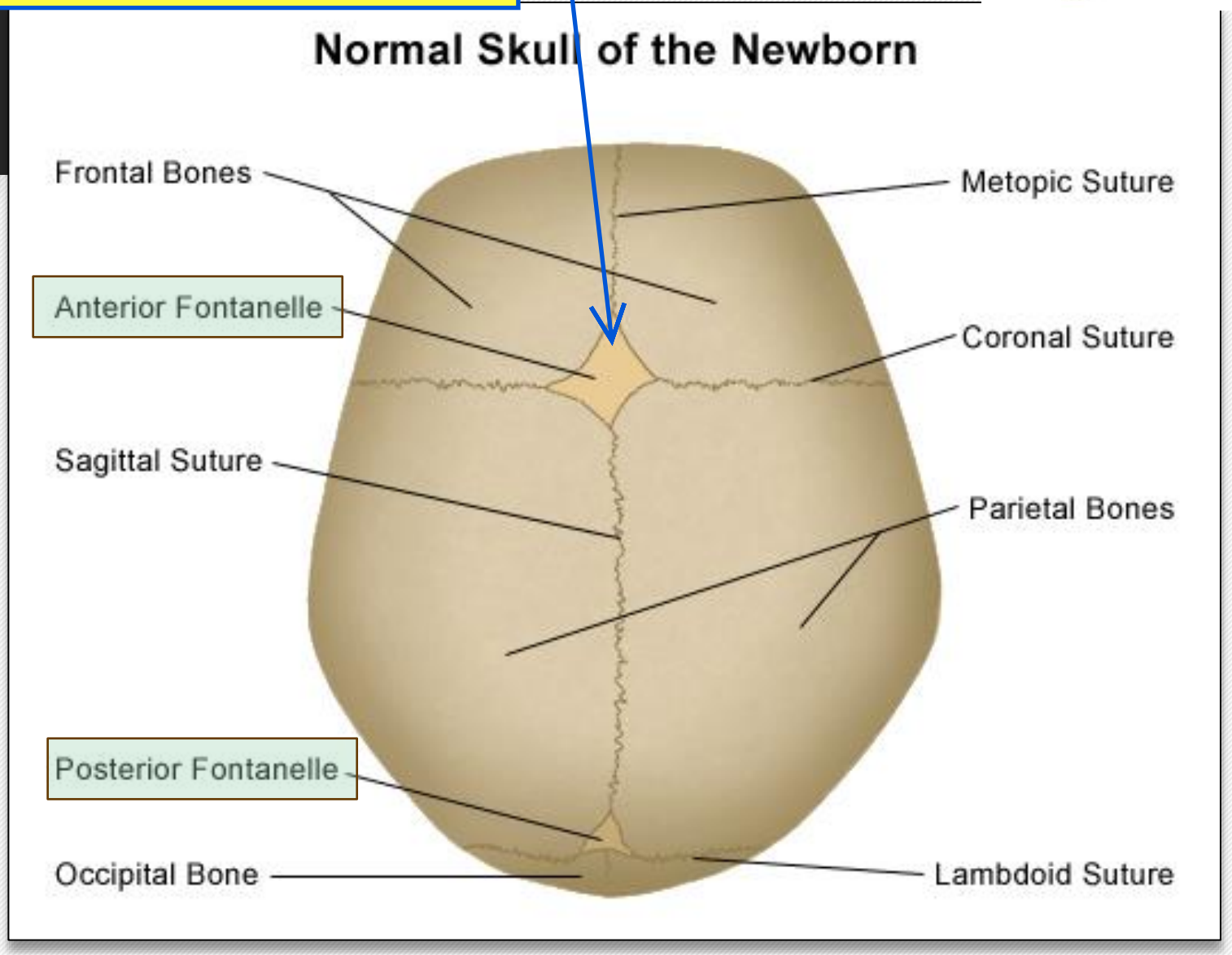
Releated dural sinus : Superior sagittal sinus

خلي بالك : الدكتورة قالت لو جت الsuture مفتوحة بالشكل دا وكتبت Bregma مش هتاخد الدرجة !

Norma Verticalis

- **Bregma:** point of meeting between sagittal and coronal sutures. At birth, it is occupied by a rhomboidal - shaped membrane called **The ANTERIOR FONTANELLE.**

- **Lambda:** the point of meeting between sagittal and lambdoid sutures. At birth it is occupied by a triangular-shaped membrane called **The POSTERIOR FONTANELLE.**



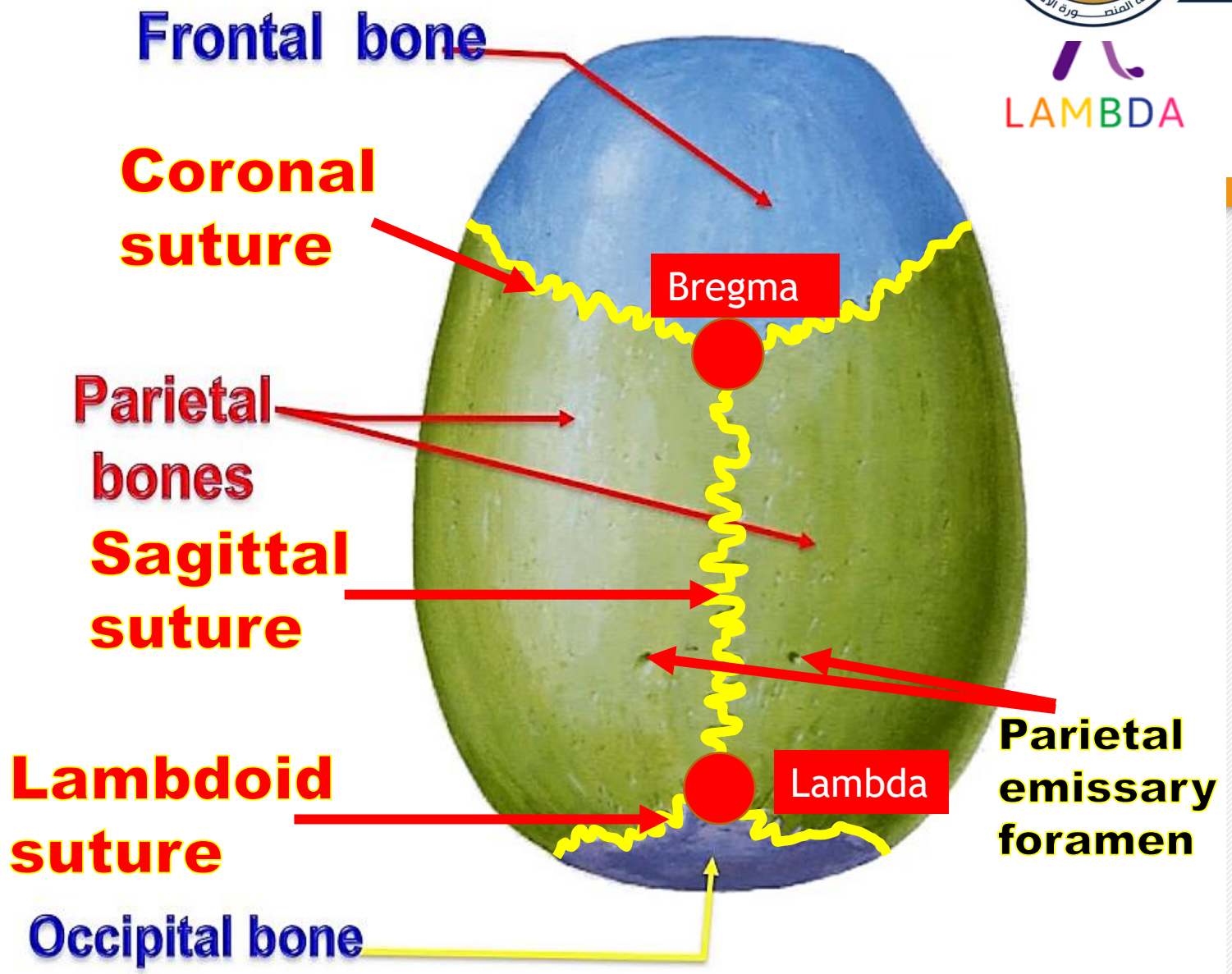
نوتس على السريع : لو الsuture مفتوحة بيكون اسمها fontanelle

Norma Verticalis

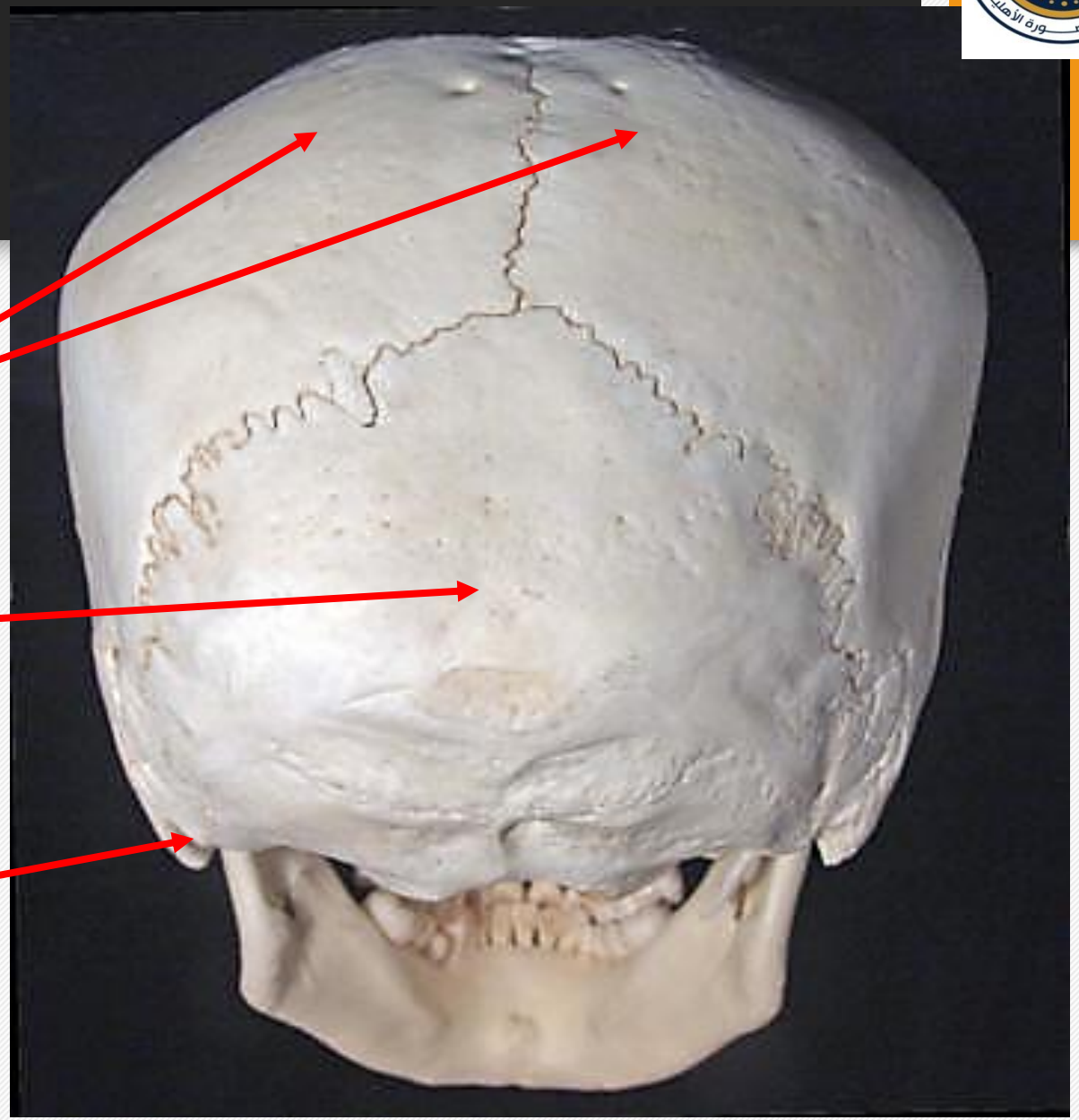
4 Bones: Frontal, 2 Parietal & Occipital

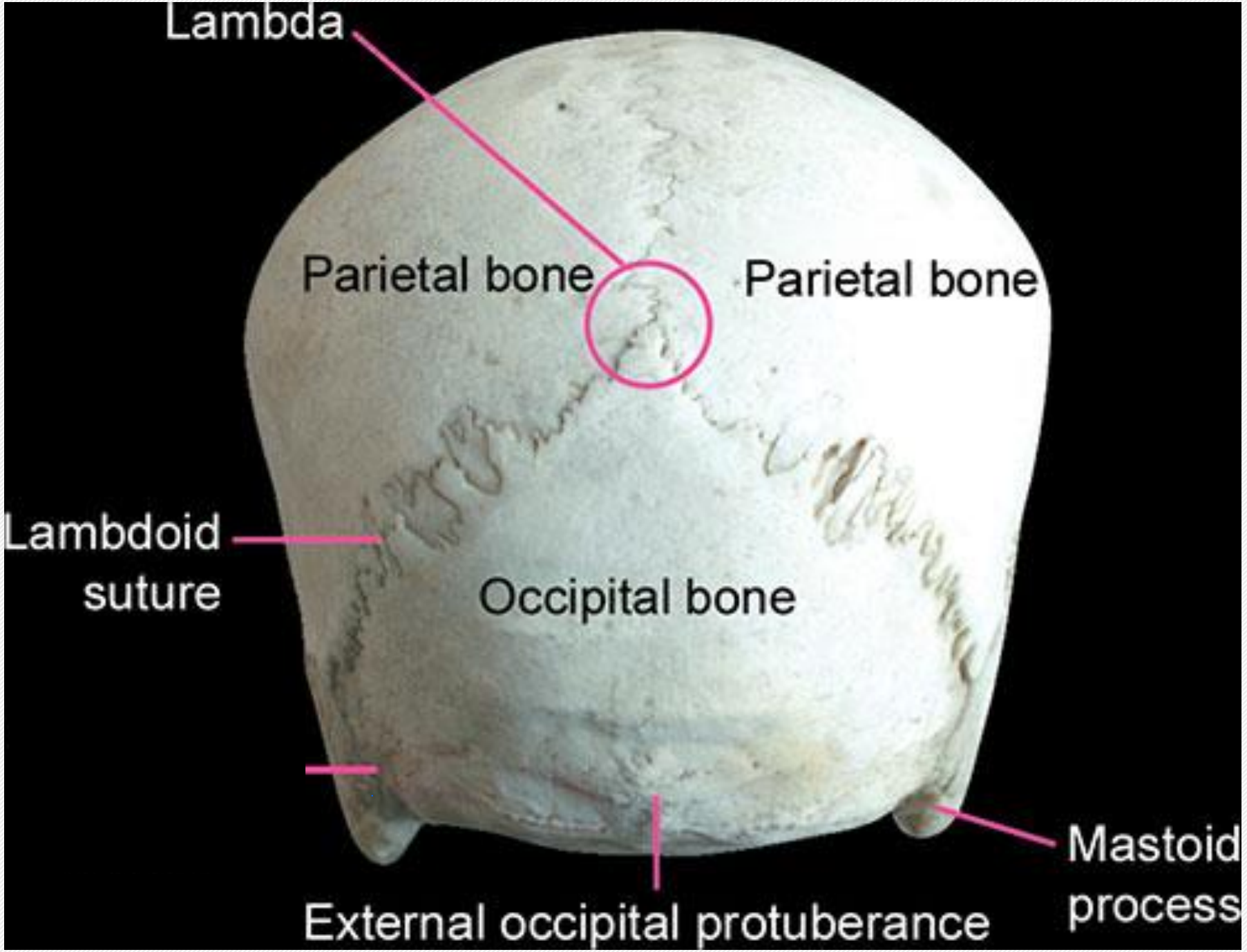
3 sutures: Coronal, Sagittal and Lamdoid

3 special features: Bregma, Lambda and parietal emissary foramen



Norma occipitalis




Lambda
Parietal bone
Parietal bone
Lambdoid suture
Occipital bone
External occipital protuberance
Mastoid process

Norma occipitalis

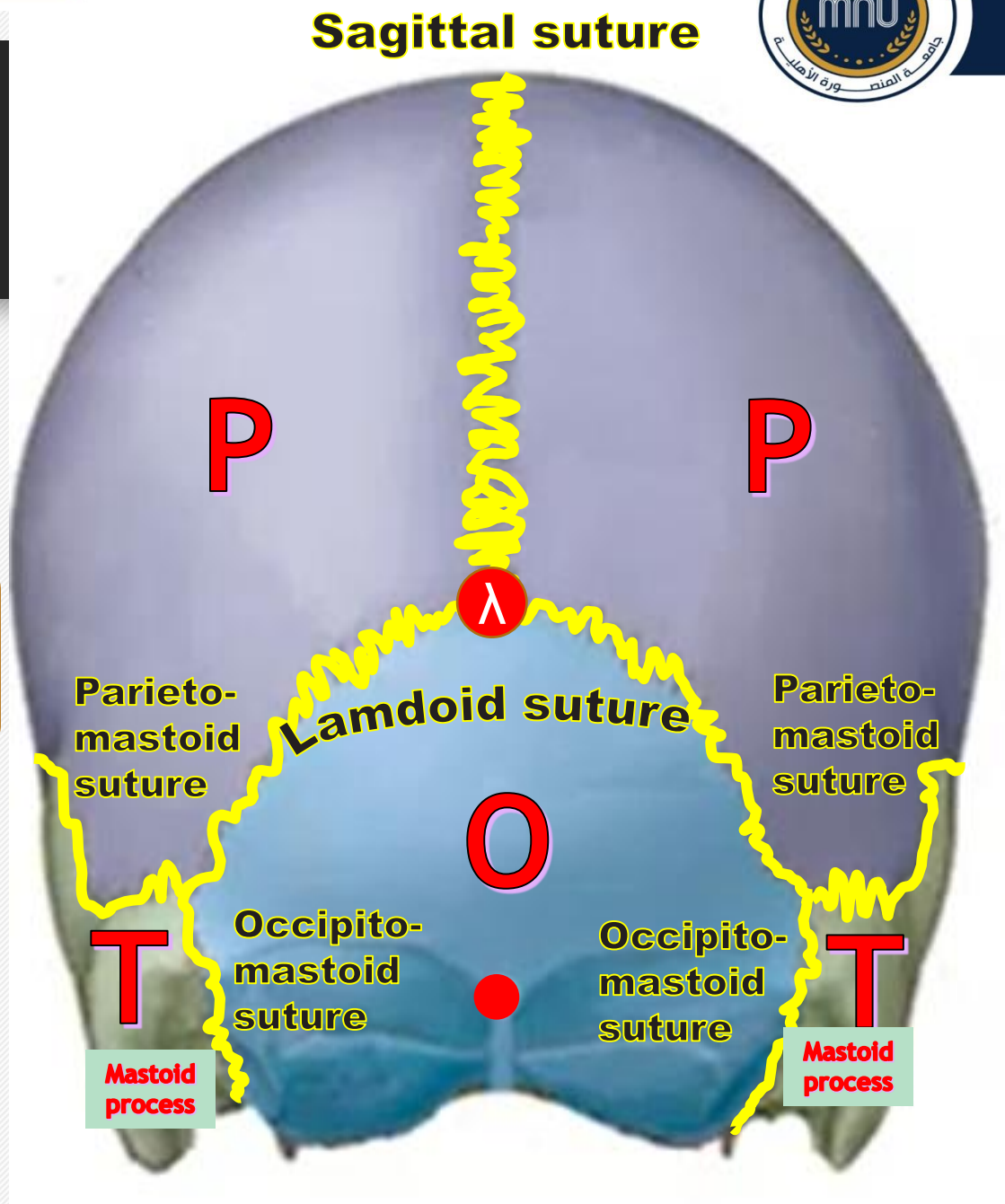
5 Bones: Occipital,
2 Parietal and 2 Temporal (mastoid)

4 Sutures: Sagittal, Lambdoid,
Parieto-mastoid and Occipito-mastoid

OSPE مهم جدا: Identify this suture ?

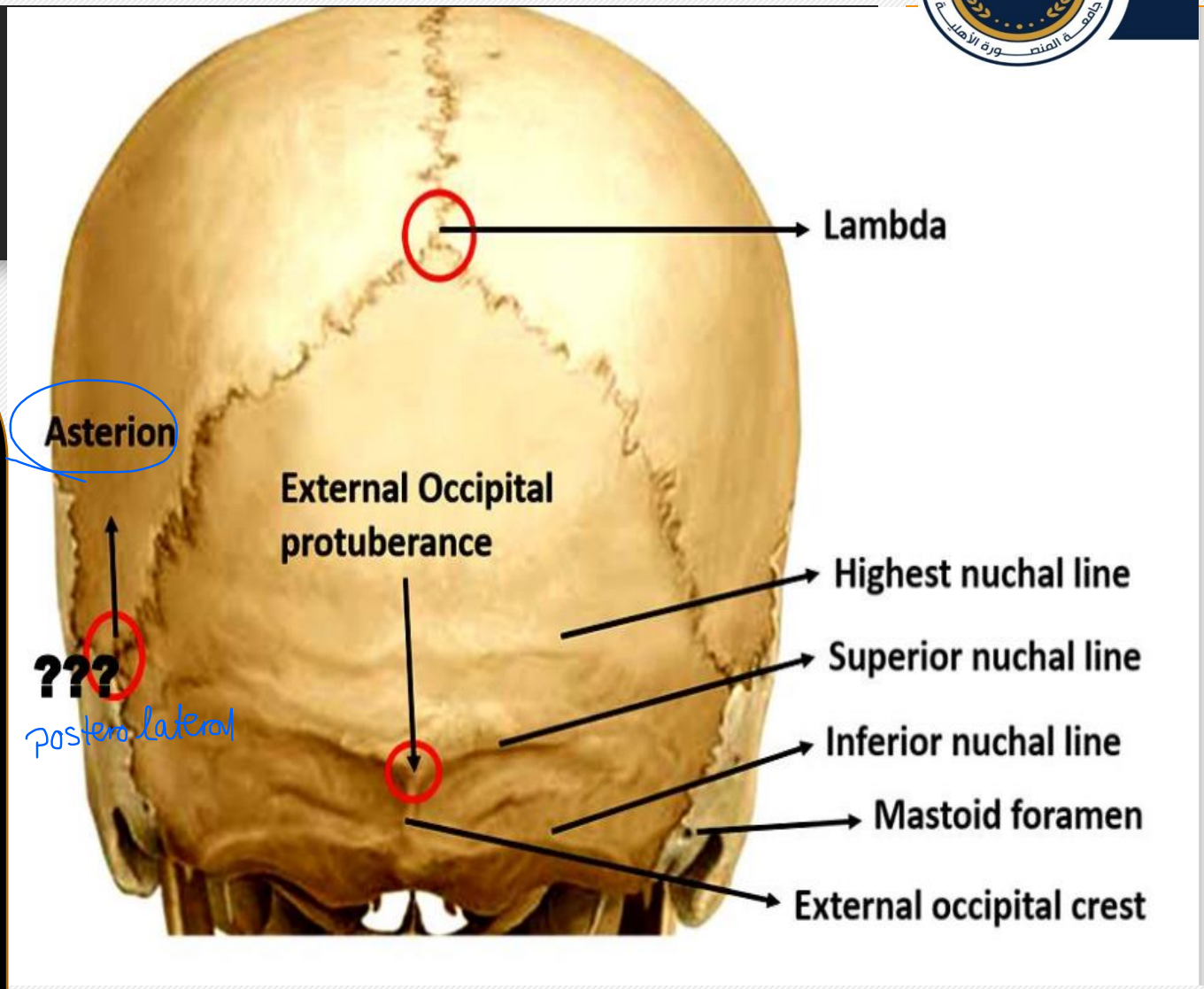
والدكتورة ذكرت الparitomastoid و

الoccipitomastoid كمثال ممكن يشاور عليهم



Norma occipitalis

6 special features:
Parietal emissary foramen
External occipital protuberance, highest nuchal line, superior nuchal line, inferior nuchal line and lambda



Norma Frontalis

Frontal bone

Nasal bone

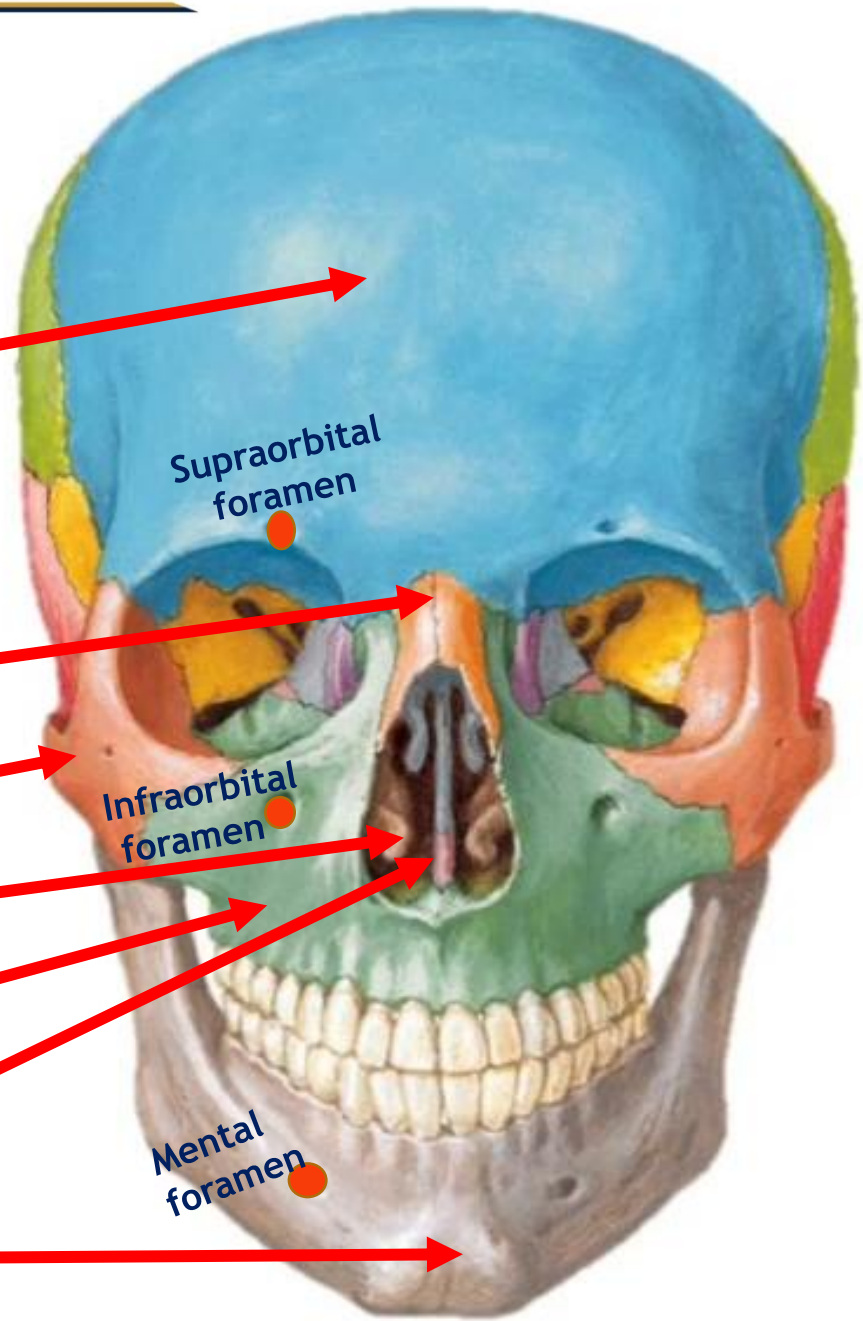
Zygomatic bone

Inferior concha

Maxilla

Nasal septum

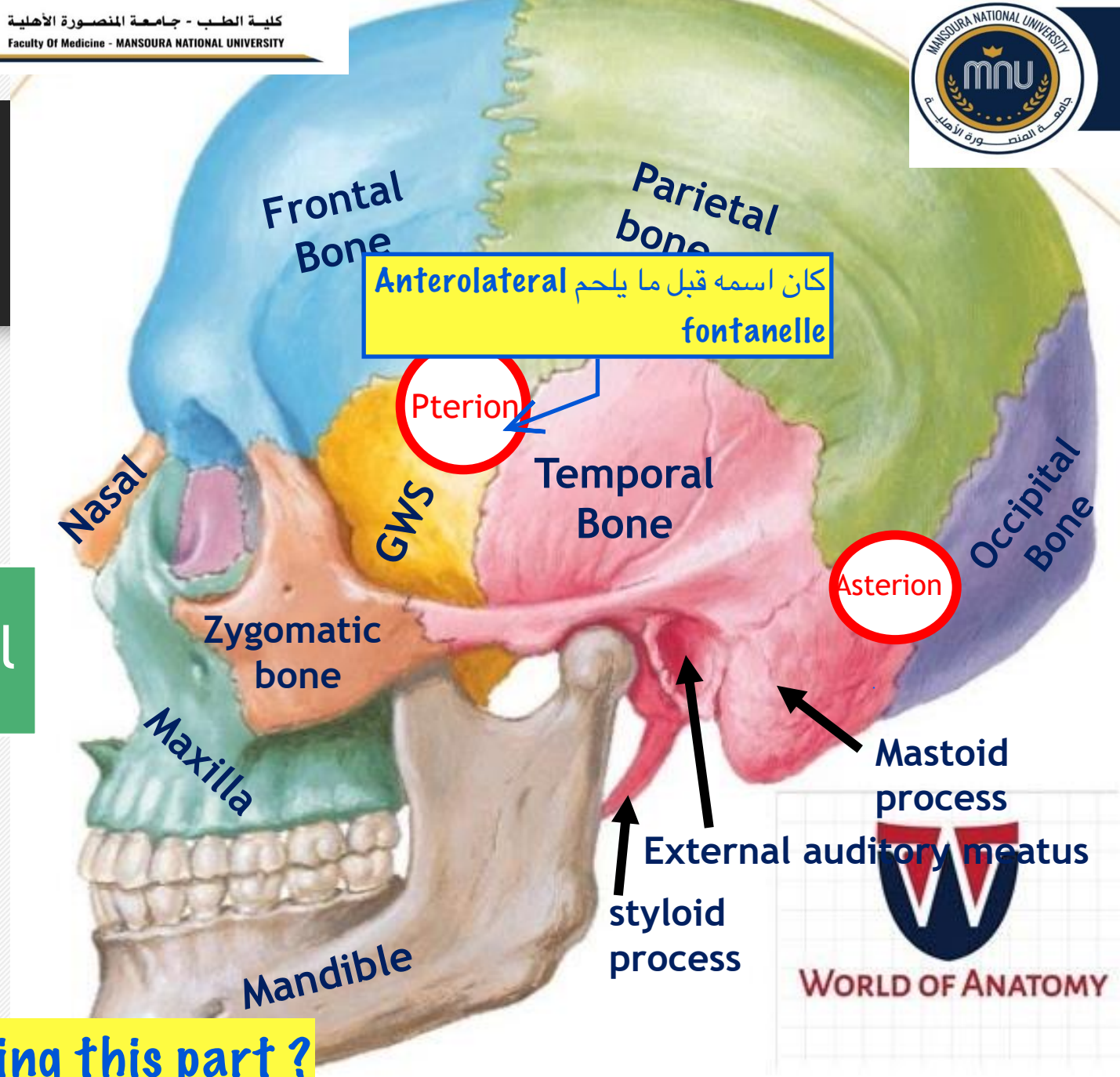
Mandible



Norma Lateralis

PTERION:
Meeting of 4 bones:

- Frontal
- Parietal
- Temporal
- Greater wing of sphenoid

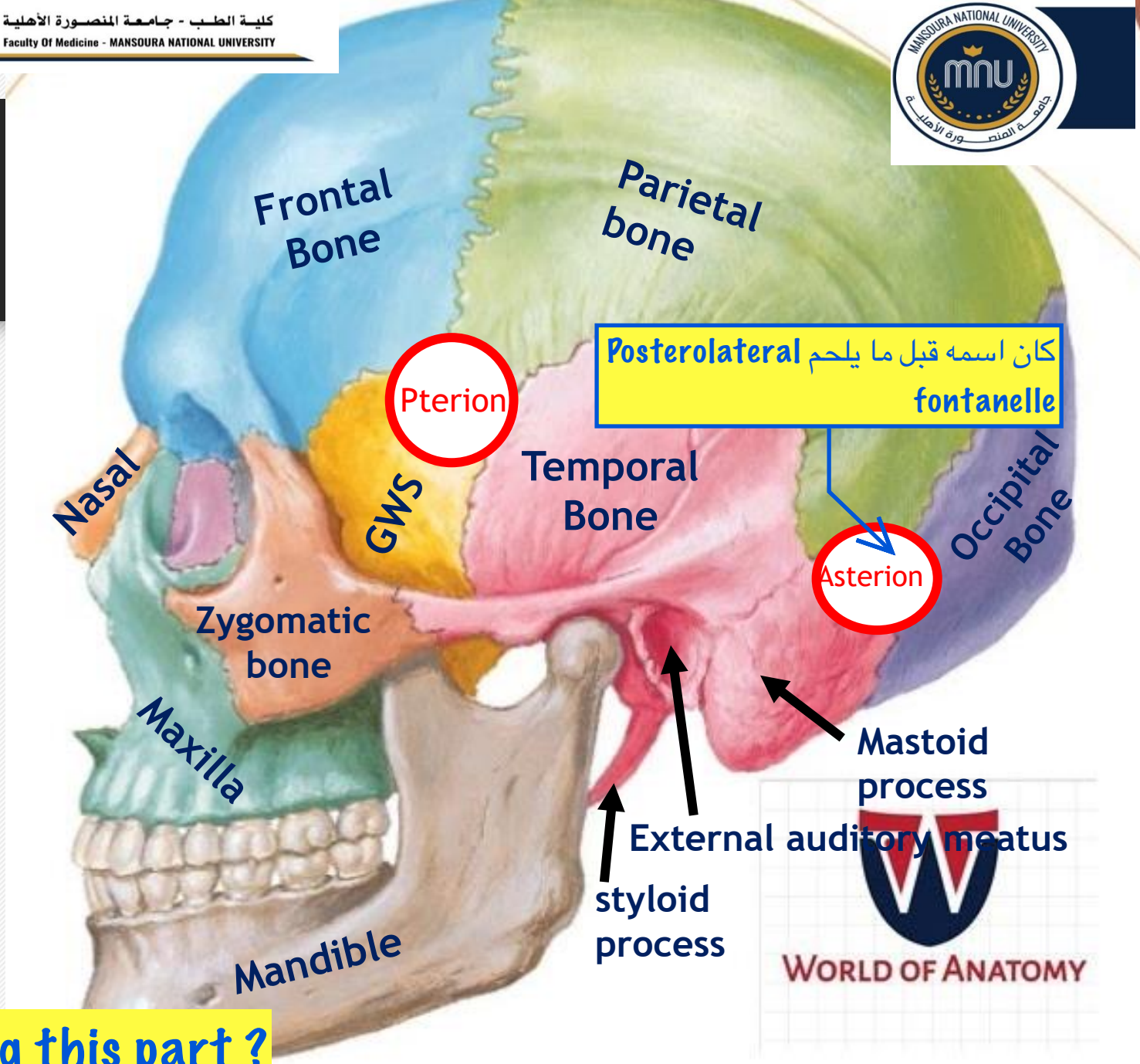


OSPE مهم : Mention the bones forming this part ?

Norma Lateralis

Asterion:
Meeting of 3 bones:

- Parietal
- Occipital
- Temporal



OSPE مهم : Mention the bones forming this part ?


Thank you!