Al-Mustaqbal University

College of Engineering & Technology

Biomedical Engineering Department

Subject Name: Anatomy II

2nd Class, Second Semester

Subject Code: [UOMU01104]

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Lecturer:Ahmed ali

Email: *...ahmed.ali.shabaan@uomus.edu.iq*

Lecture No.: - 9-

Lecture Title: [brain stem and cerebellum]

ANATOMY II/ 2nd Stage

Head and Neck

Lec. 9

Brain stem and Cerebellum

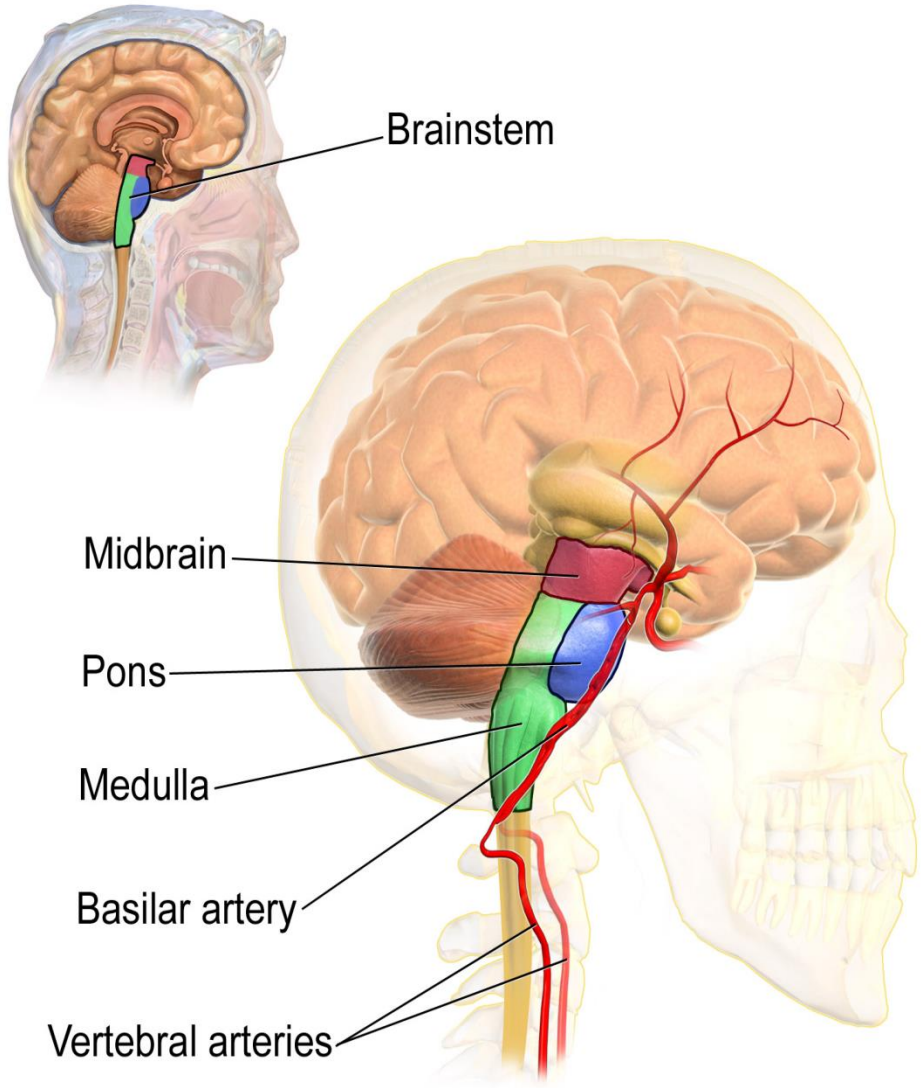
Brain stem

- Critically important part of the central nervous system, contains centers that take control of consciousness, cardiorespiratory regulation and many important reflexes.
- Complex structure - contains different groups of nuclei and fiber pathways.

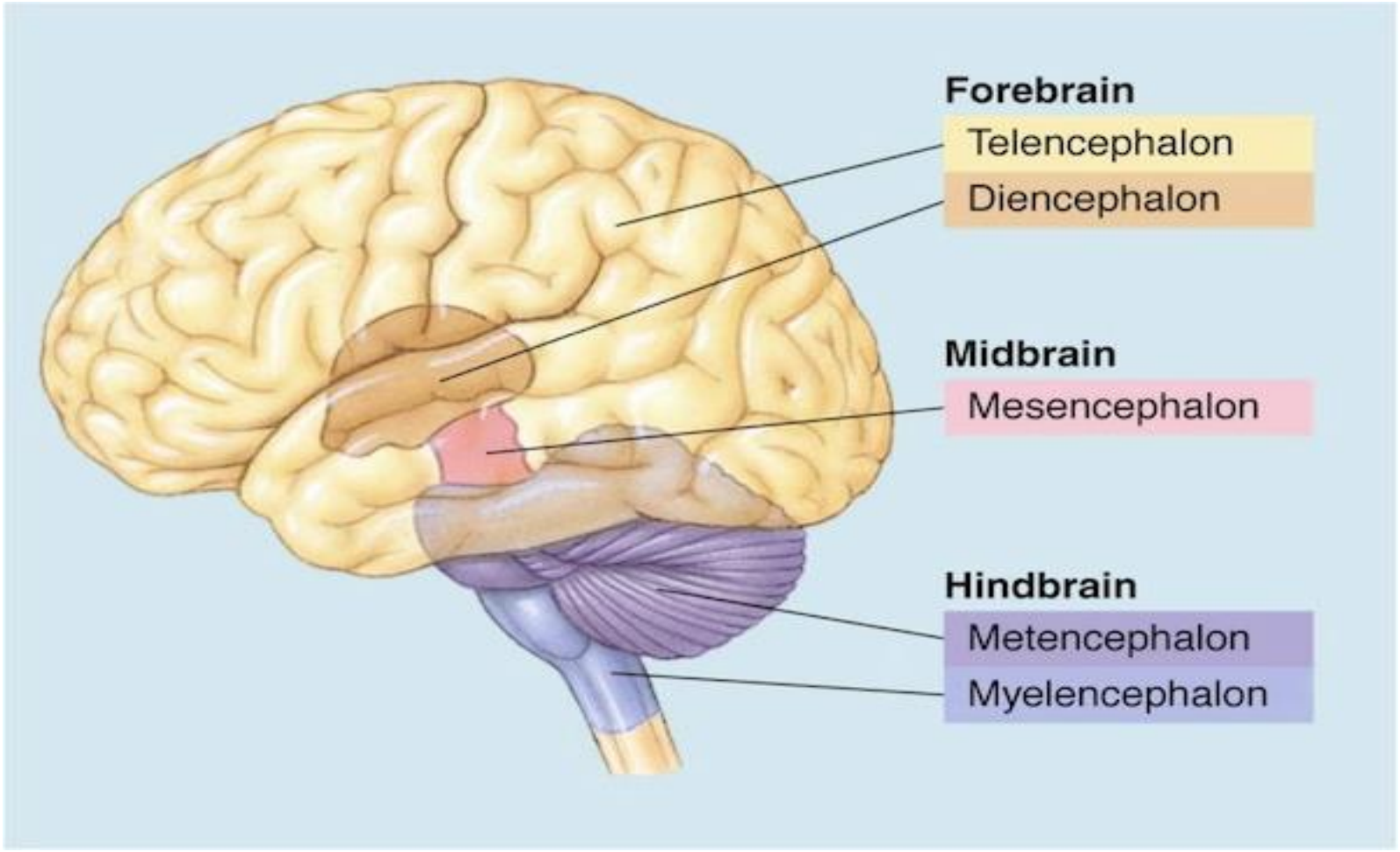
Brain stem

3 major divisions:

1. Midbrain
2. Pons
3. Medulla

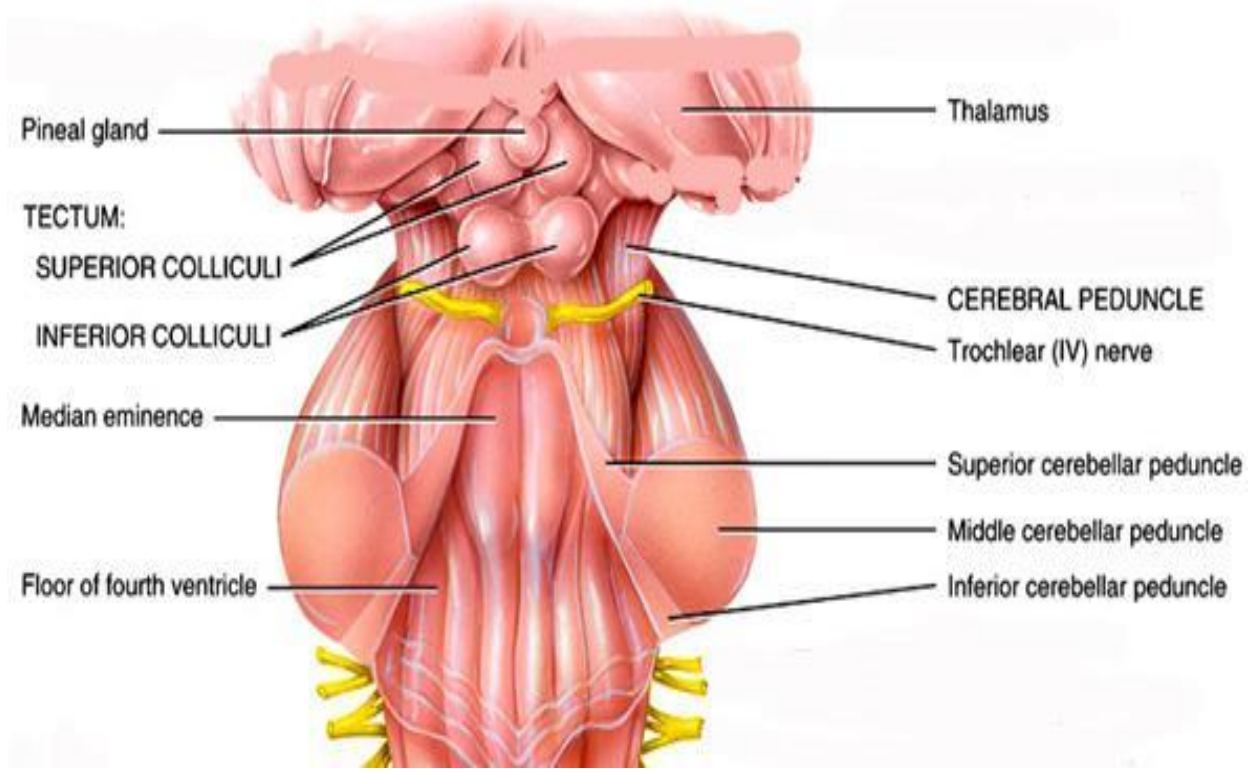


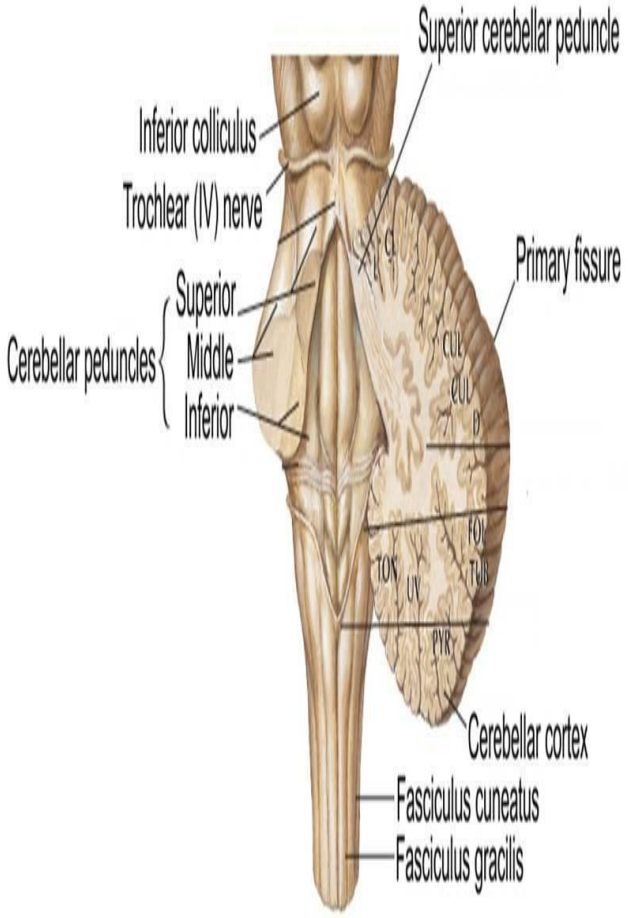
The **midbrain** connect the **forebrain** to the **hindbrain.**



The midbrain comprises

1. Two lateral halves (cerebral peduncles)
2. Tectum



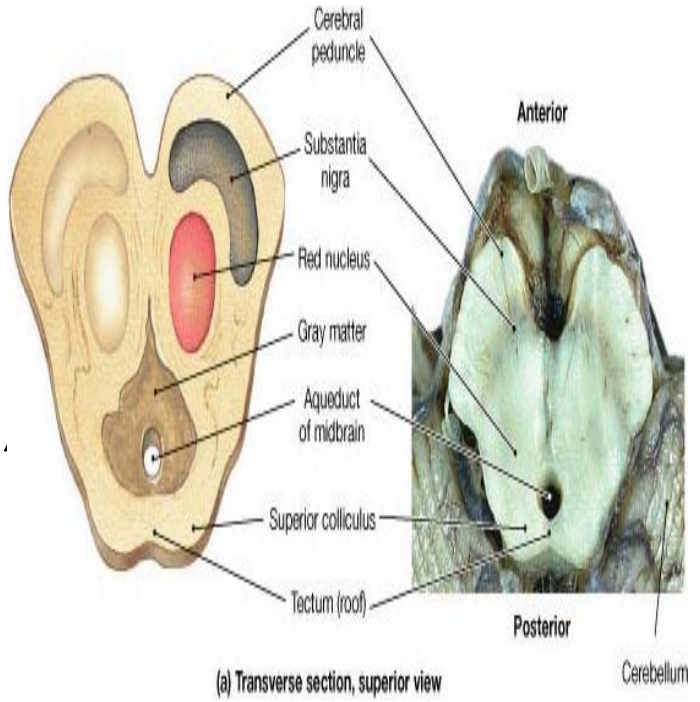


Cerebral peduncle

Is divided by a pigmented band of gray matter (substantia nigra) into

1. **Crus cerebri (anterior part)**
2. **Tegmentum (posterior part)**

Crus cerebri: 2 bulging on the inner side of cerebral peduncles These contain descending fibers that go to the cerebellum via the pons.



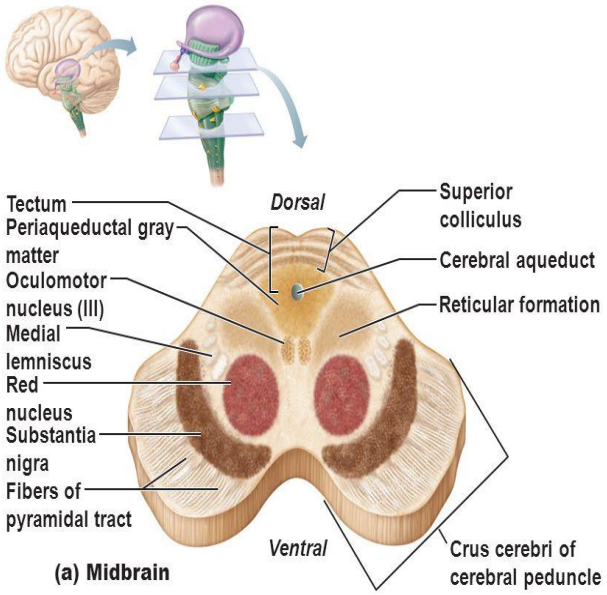
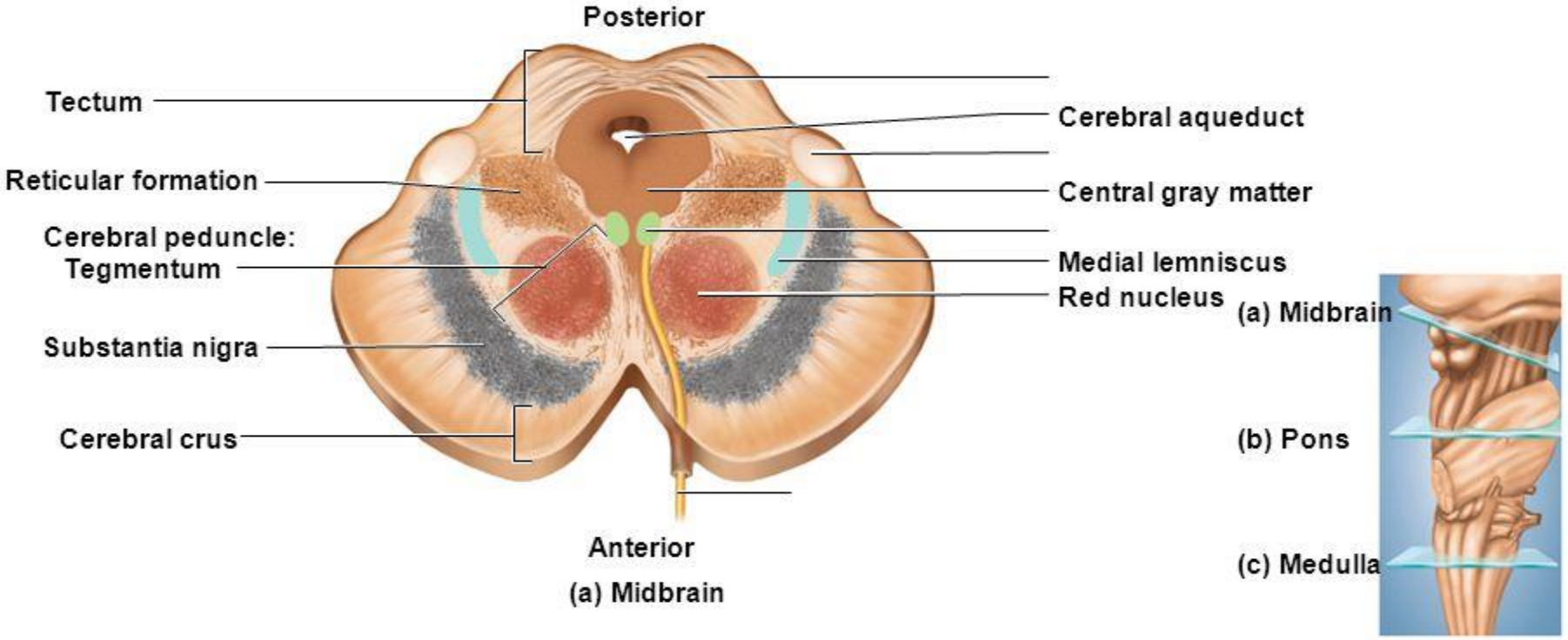


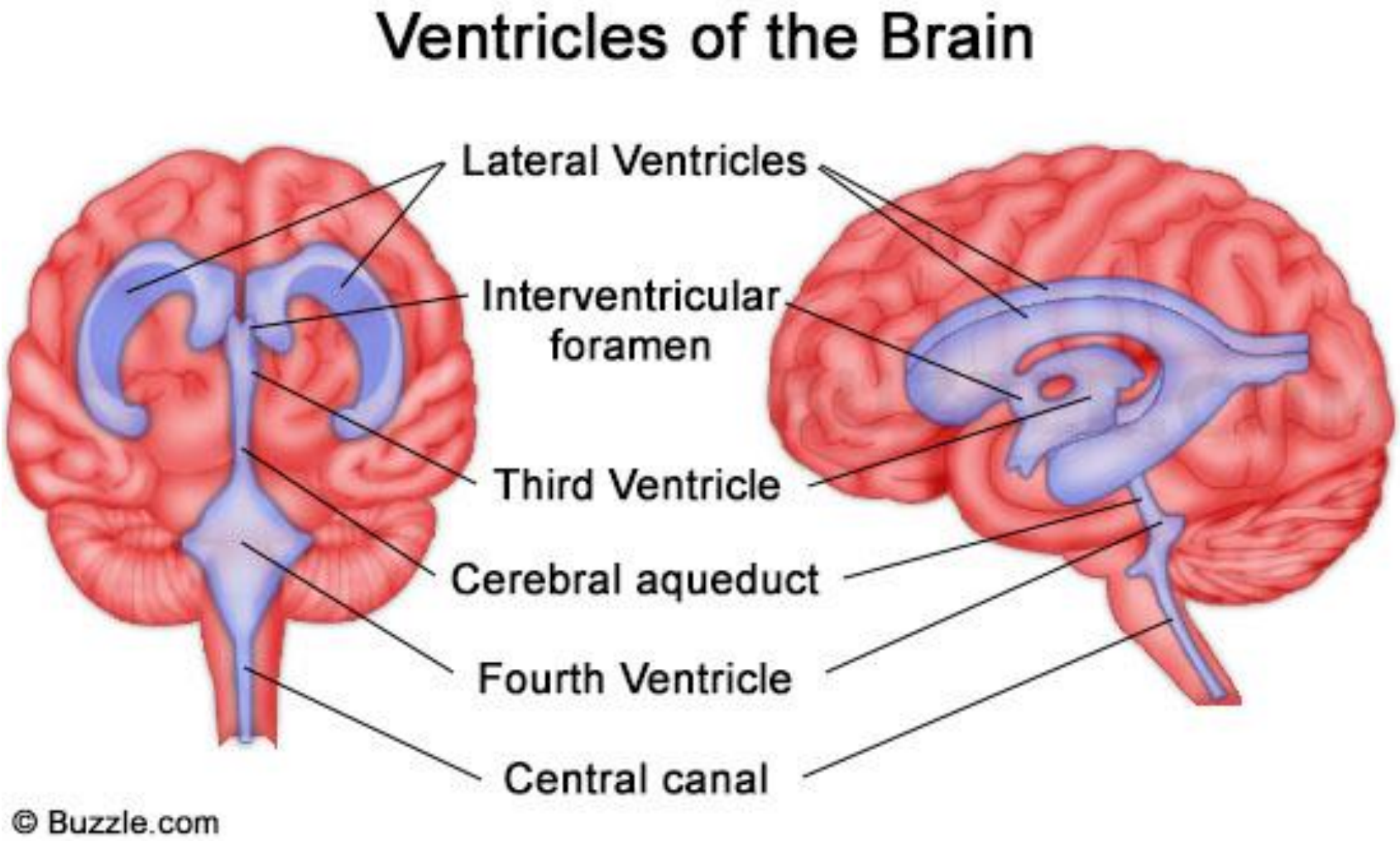
Figure 12.16a

Midbrain -- Cross Section



Cerebral aqueduct

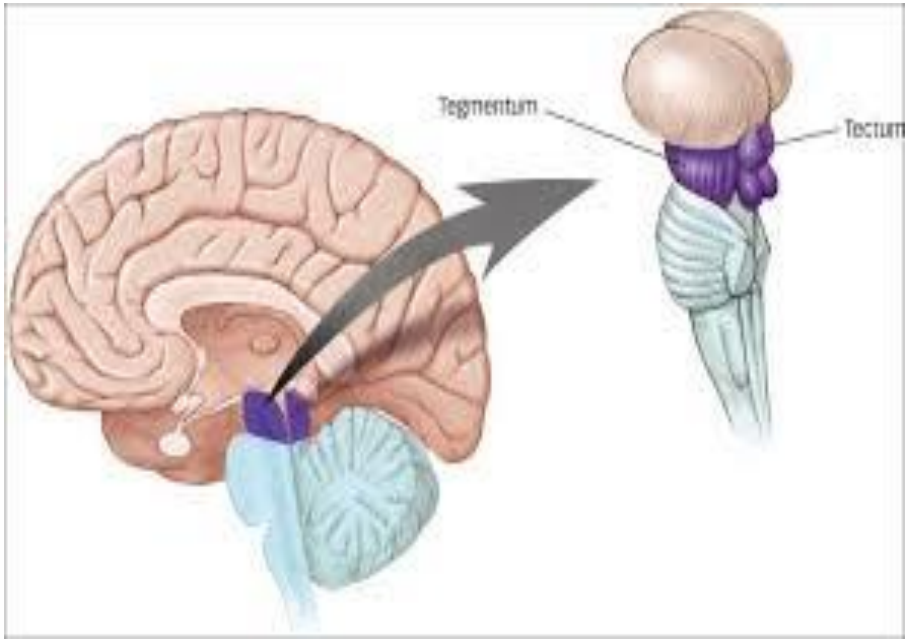
- Is the narrow cavity of the midbrain connects the third and fourth ventricles.

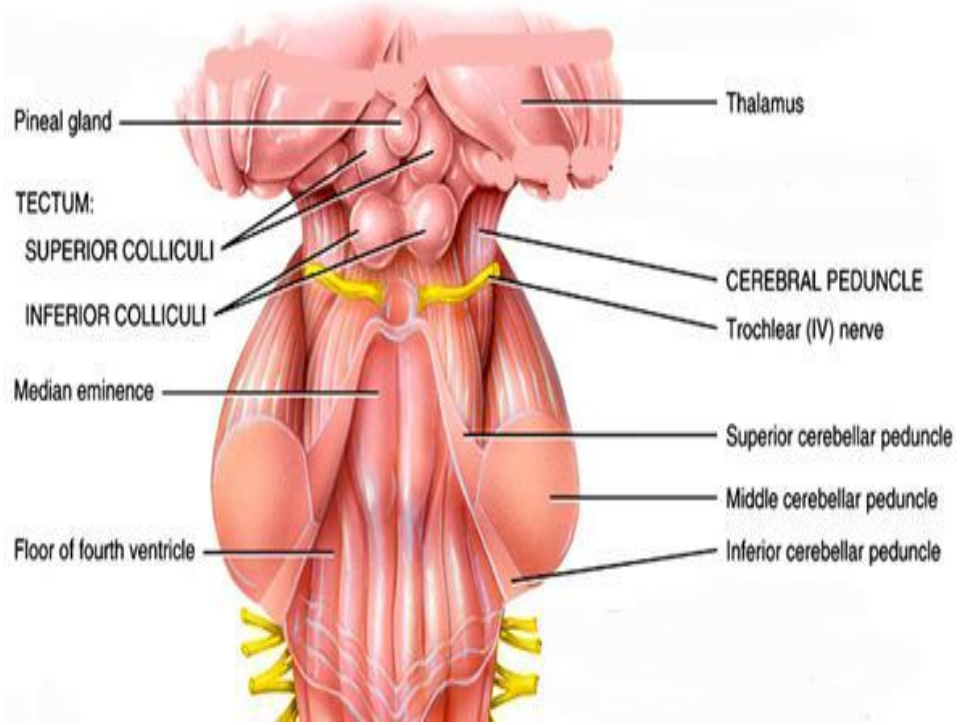


The Tectum

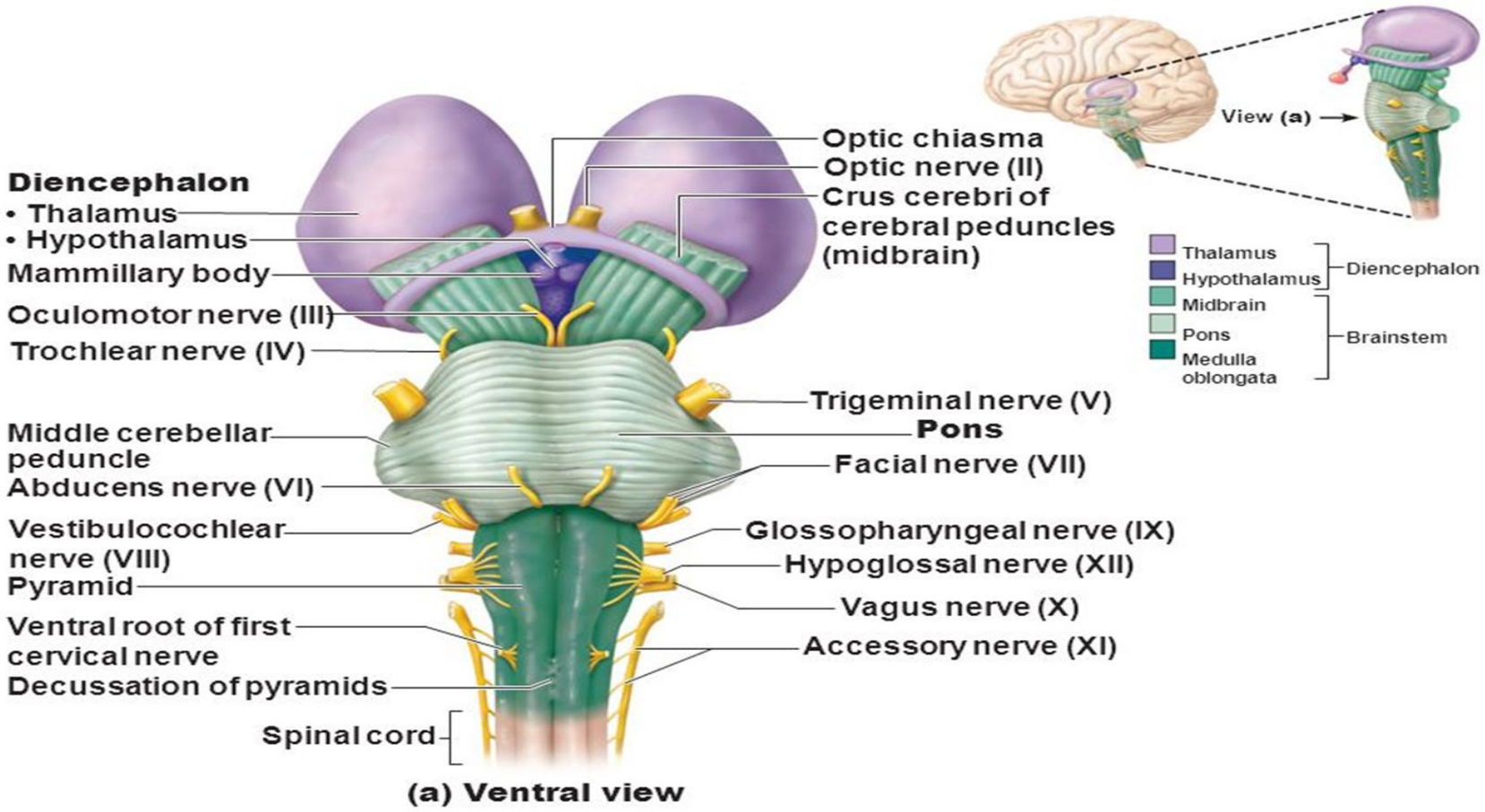
- is the part of the midbrain , it has four swellings

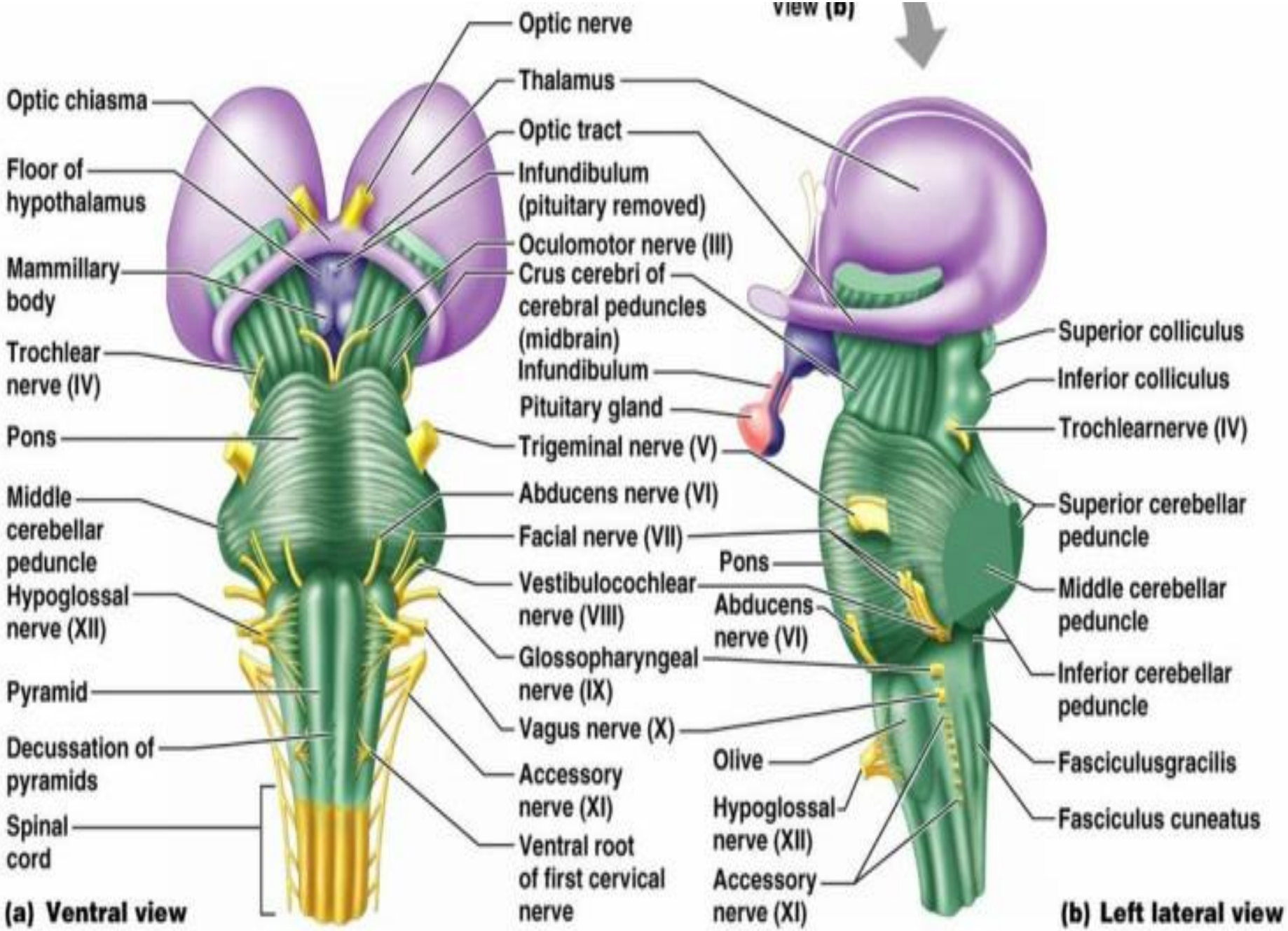
1. **2 superior colliculi** that control reflex movements of the eyes, head and neck in response to visual stimuli
2. **2 inferior colliculi** that control reflex movements of the head, neck, and trunk in response to auditory stimuli





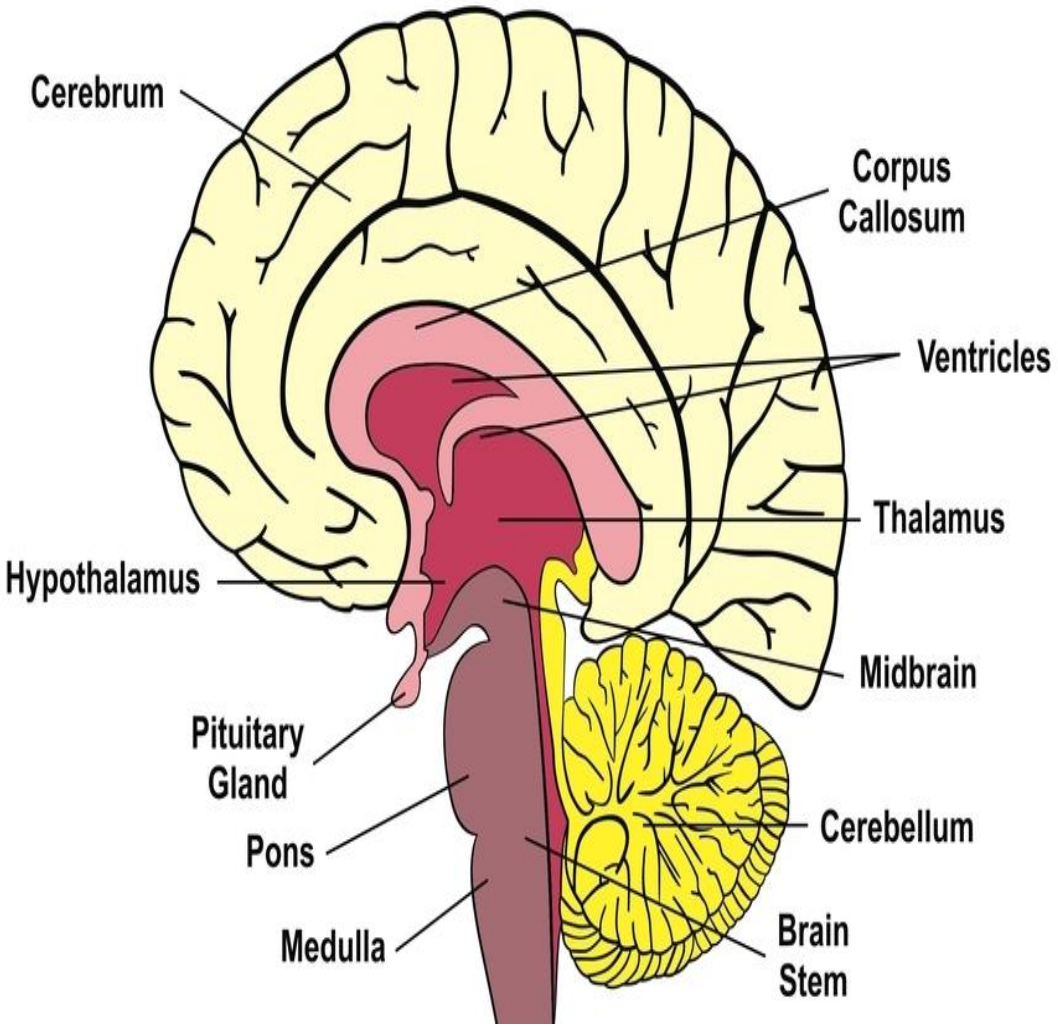
- Cranial nerves 3&4 (oculomotor and trochlear) exit from the midbrain




Optic nerve
Optic chiasma
Thalamus
Optic tract
Floor of hypothalamus
Infundibulum (pituitary removed)
Oculomotor nerve (III)
Mammillary body
Crus cerebri of cerebral peduncles (midbrain)
Trochlear nerve (IV)
Infundibulum
Pituitary gland
Pons
Trigeminal nerve (V)
Middle cerebellar peduncle
Abducens nerve (VI)
Facial nerve (VII)
Hypoglossal nerve (XII)
Vestibulocochlear nerve (VIII)
Glossopharyngeal nerve (IX)
Pyramid
Vagus nerve (X)
Decussation of pyramids
Accessory nerve (XI)
Spinal cord
Ventral root of first cervical nerve
(a) Ventral view
View (b)
Superior colliculus
Inferior colliculus
Trochlearnerve (IV)
Superior cerebellar peduncle
Pons
Middle cerebellar peduncle
Abducens nerve (VI)
Inferior cerebellar peduncle
Olive
Fasciculusgracilis
Hypoglossal nerve (XII)
Fasciculus cuneatus
Accessory nerve (XI)
(b) Left lateral view

PONS

- The pons is situated on the anterior surface of the cerebellum below the midbrain and above the medulla oblongata.



It Contains:

A-Sensory and motor nuclei for 4 cranial nerves

1- Trochlear (4)

2-Trigeminal (5)

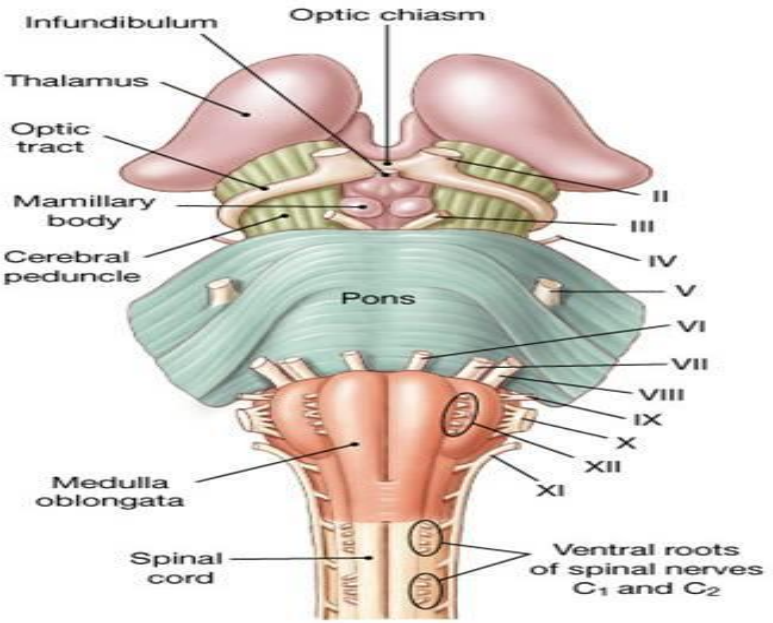
3- Abducens (6)

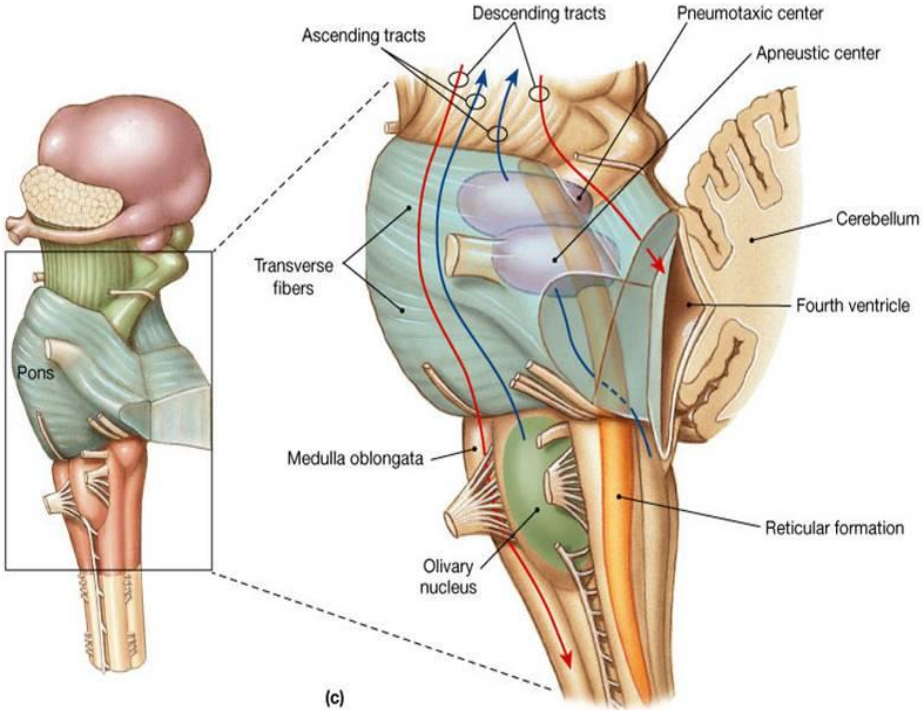
4- Facial (7)

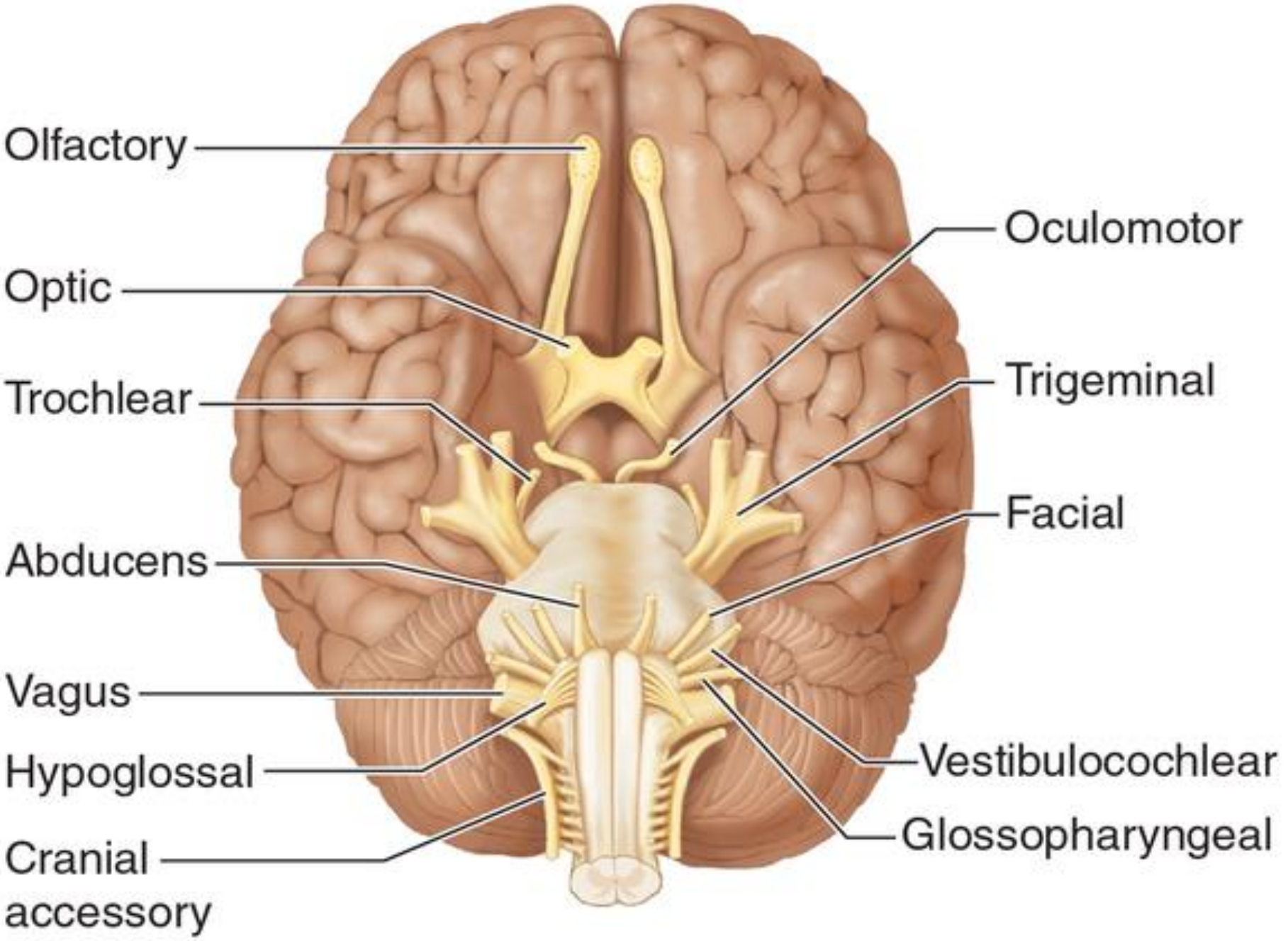
B-Respiratory nuclei.

C-Nuclei & tracts .that relay information to/from **the cerebellum**

D-Ascending, descending, and transverse tracts that interconnect other portions of the CNS(Central Nervous System)

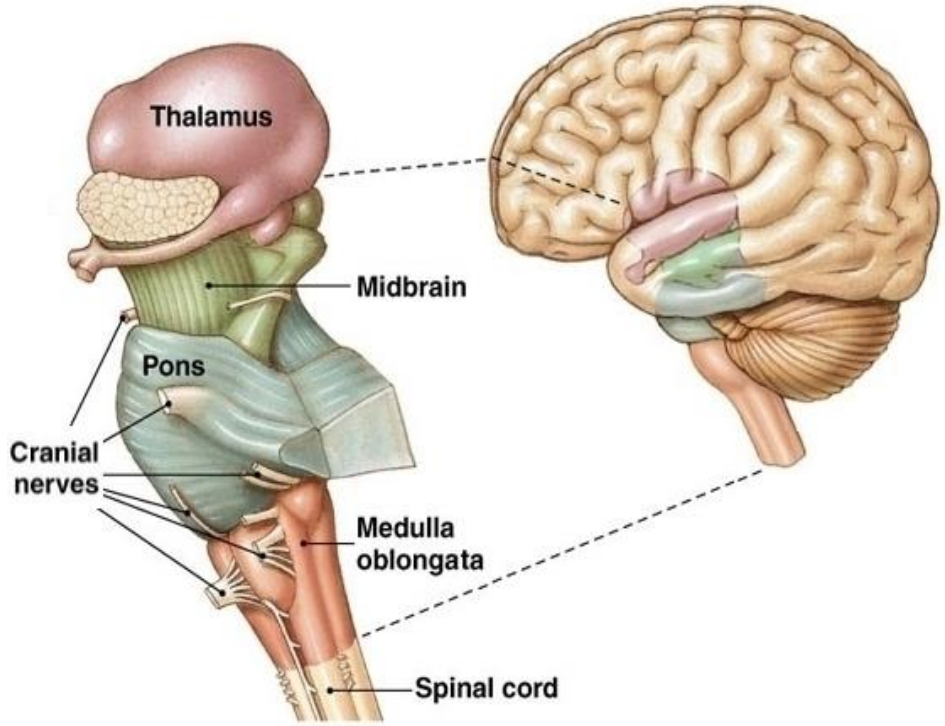


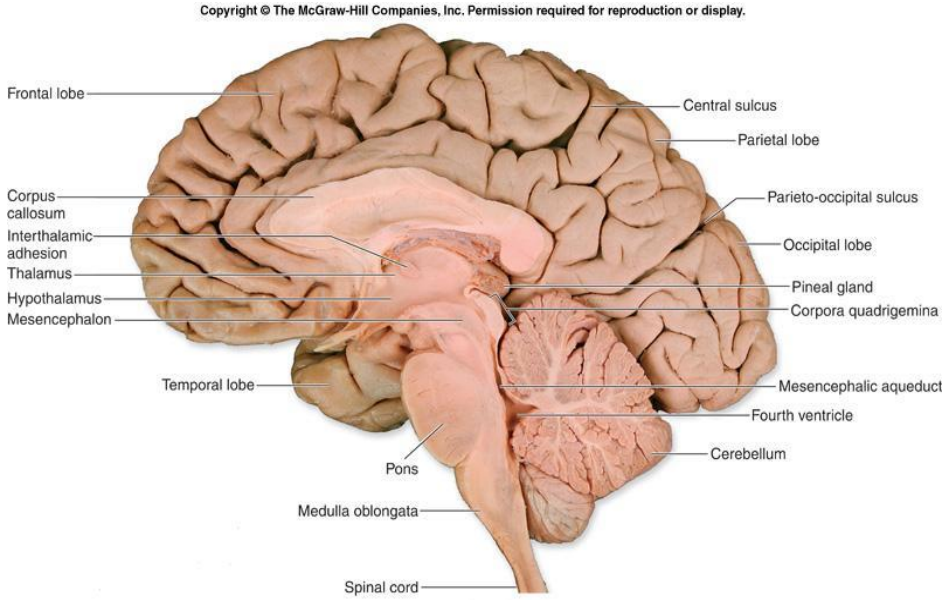


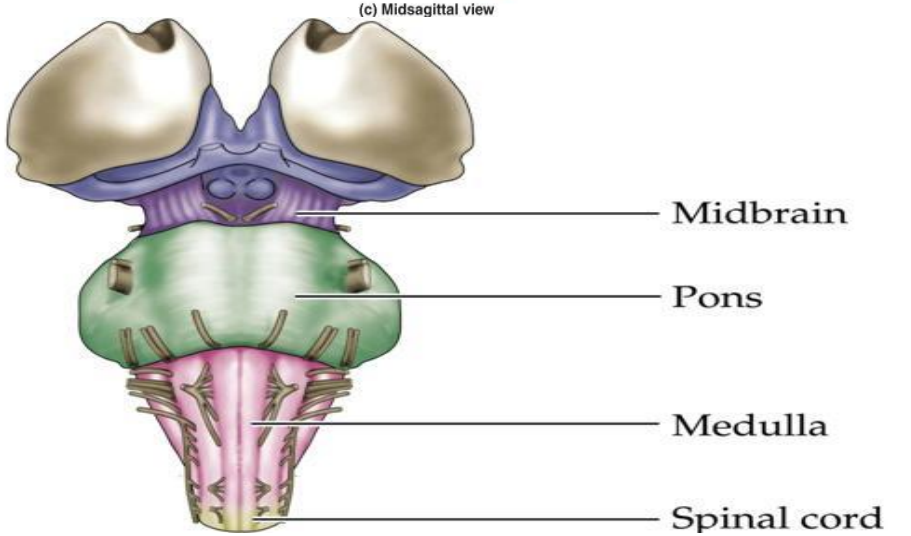

Olfactory
Optic
Trochlear
Abducens
Vagus
Hypoglossal
Cranial accessory
Oculomotor
Trigeminal
Facial
Vestibulocochlear
Glossopharyngeal

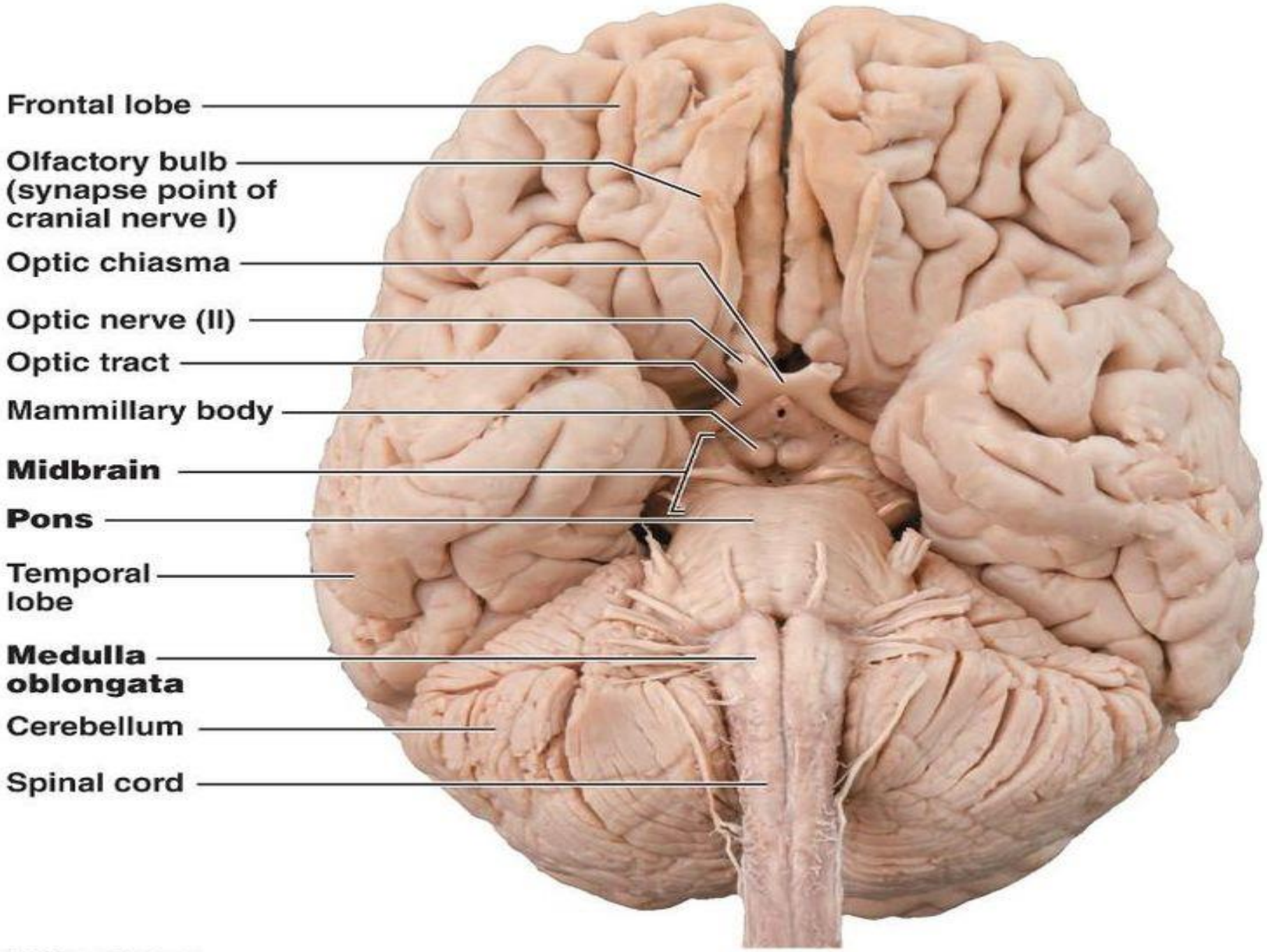
Medulla Oblongata

- Most inferior region of the brain stem. Becomes the spinal cord at the level of the foramen magnum.



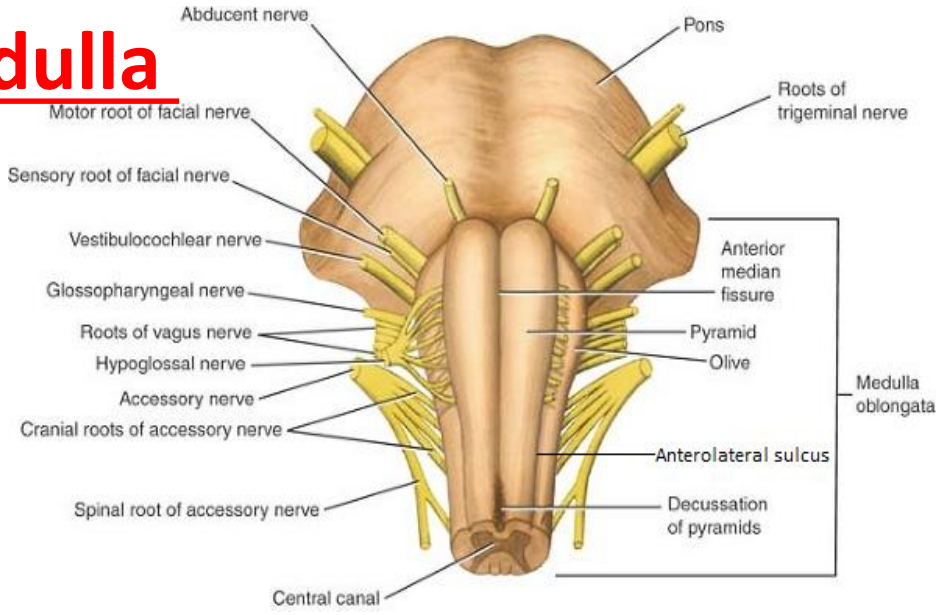


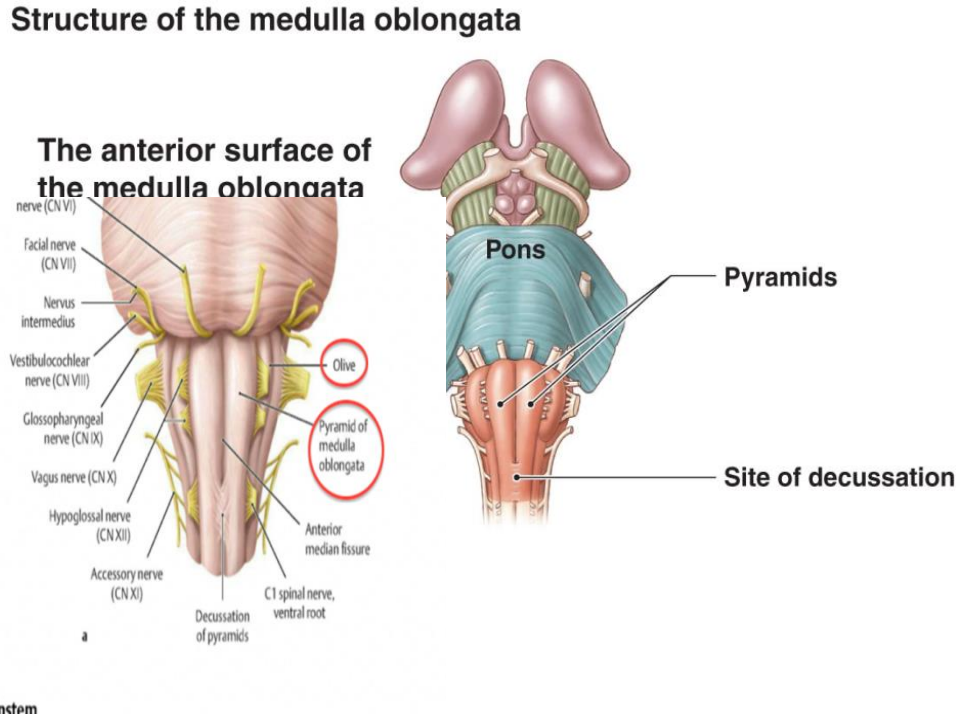


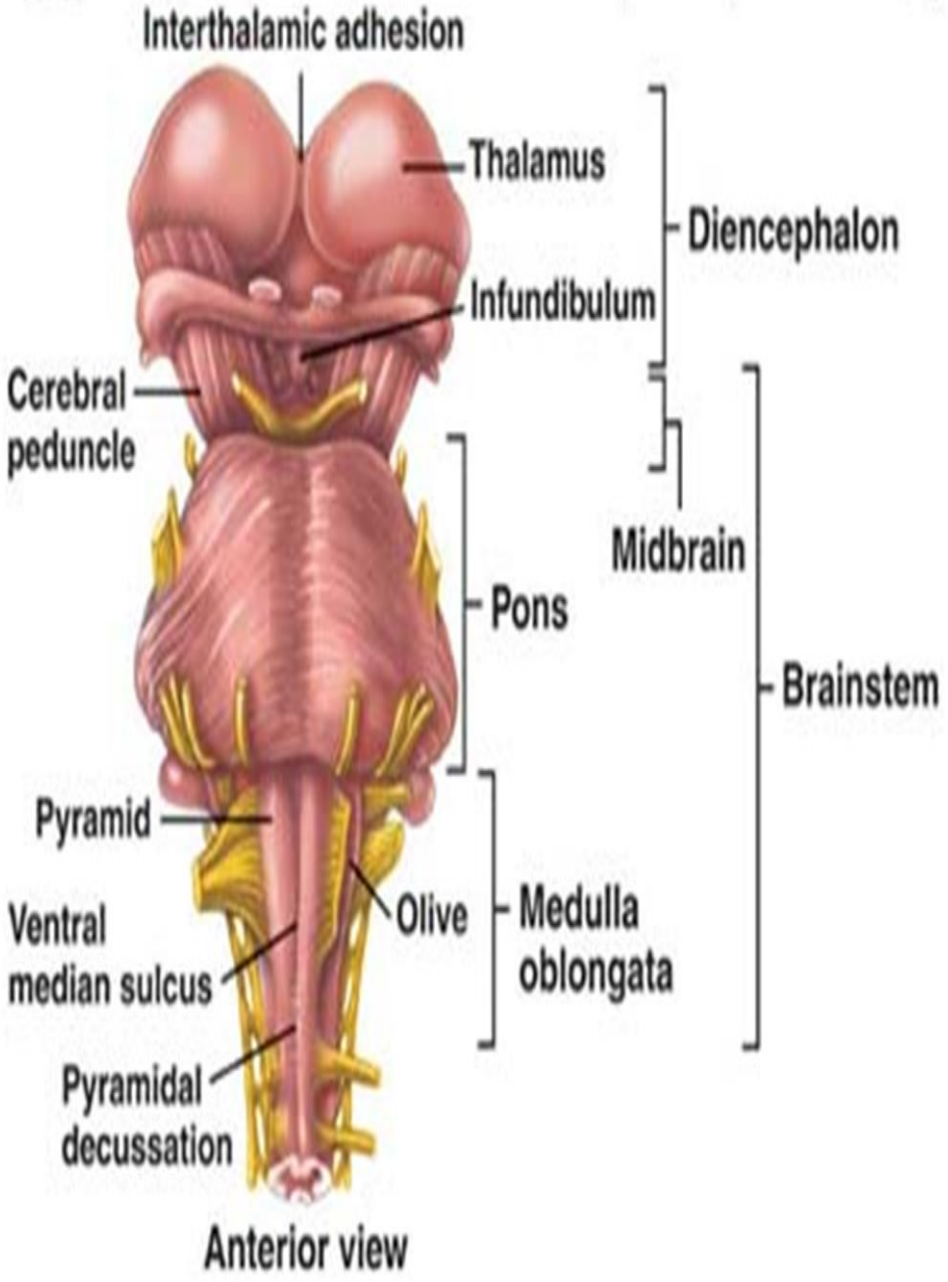


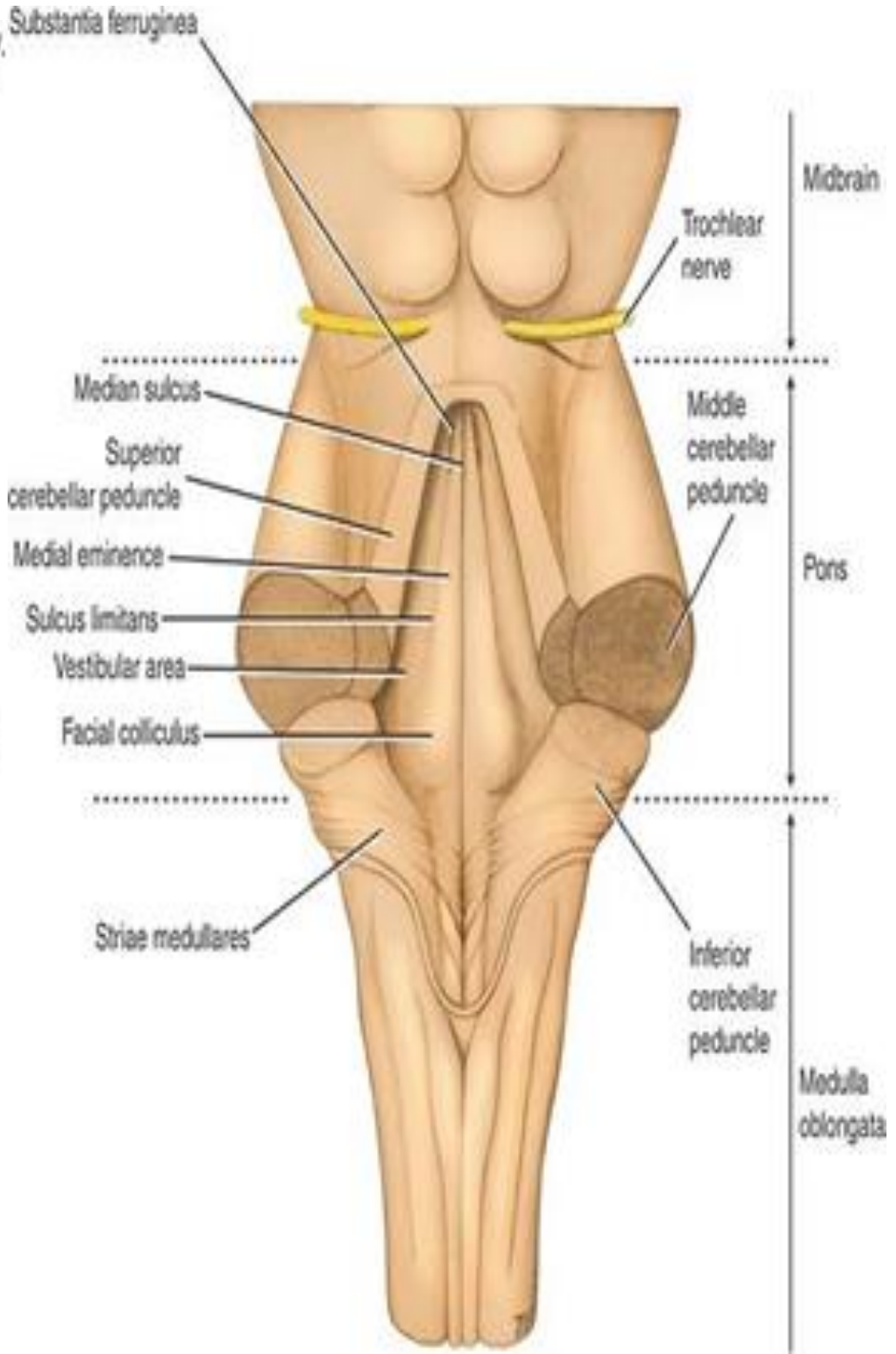
Anterior surface of the medulla

- **Anterior median fissure**
- **The pyramids** are composed of bundles of nerve fibers that originate in large nerve cells in the precentral gyrus of the cerebral cortex.
- The pyramids taper below, and here most of the descending fibers cross over to the opposite side, forming the **decussation of the pyramids**.
- **olives tubercle** produced by the underlying olivary nuclei .
- **the inferior cerebellar peduncles**, connect the medulla to the cerebellum.



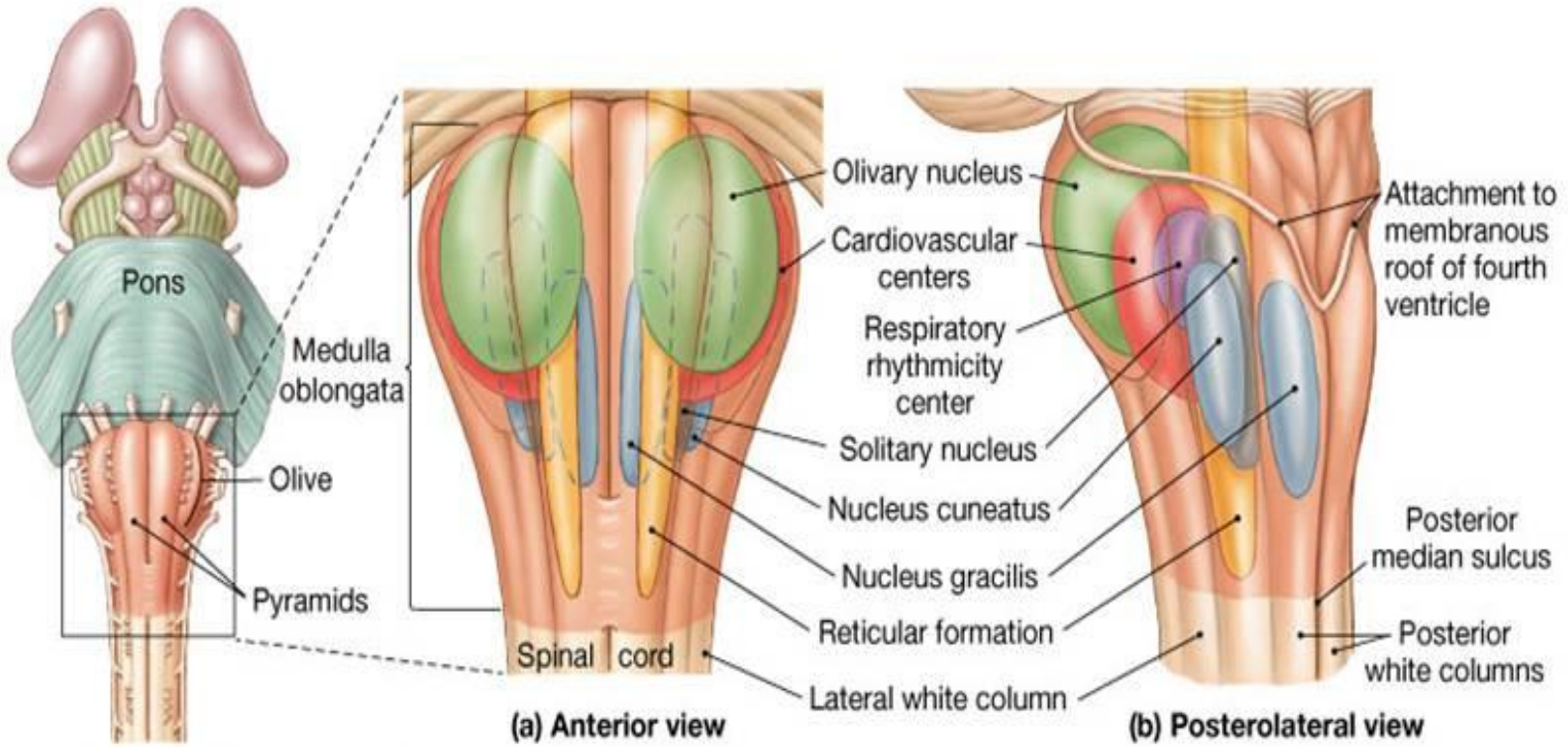






Posterior surface of the medulla

- The gracile and cuneate tubercles, produced by underlying gracilis and cuneatus nucleus



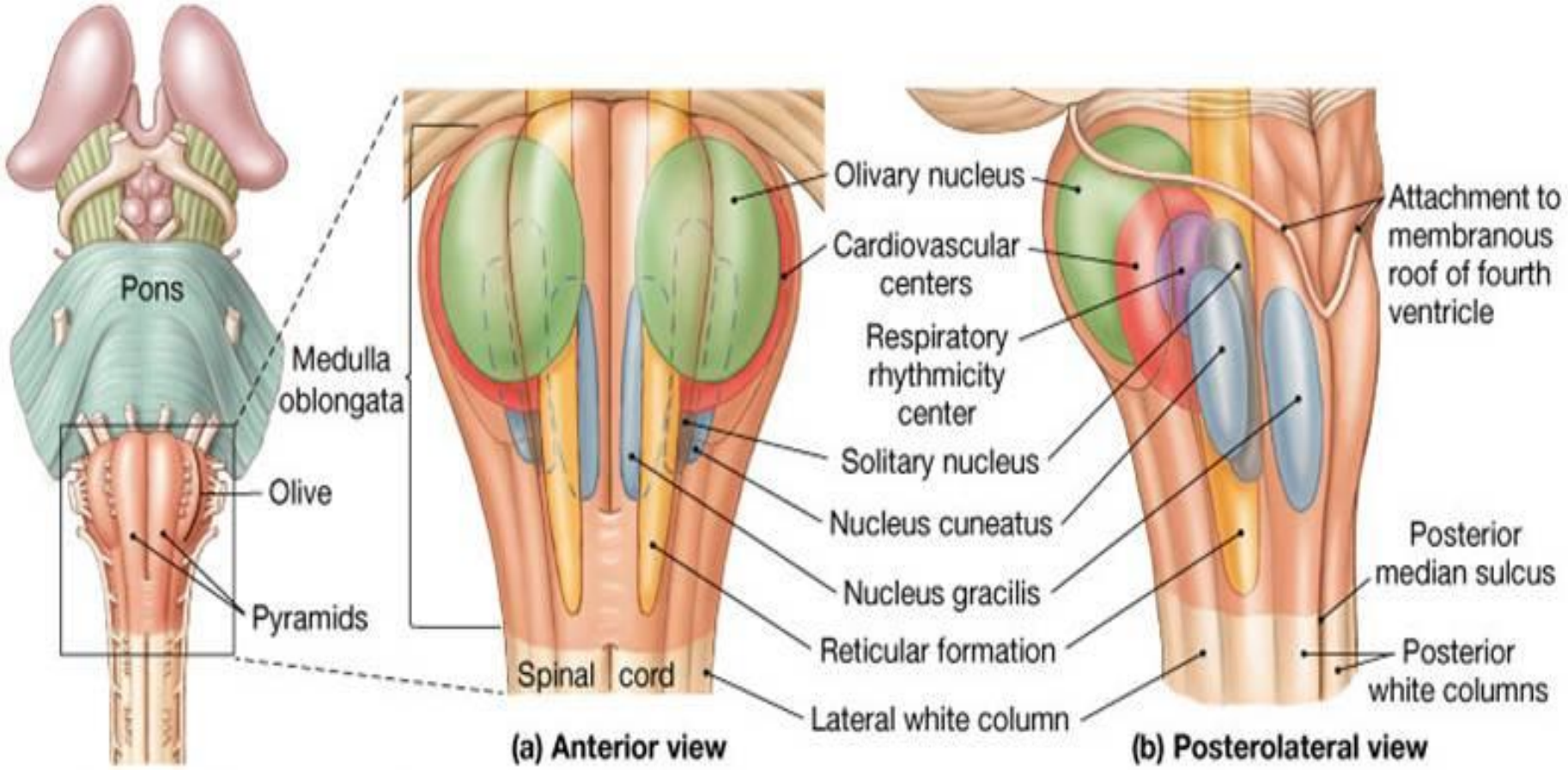
Nuclei in the medulla are associated with autonomic control, cranial nerves, and motor/sensory relay

- **Autonomic nuclei:**

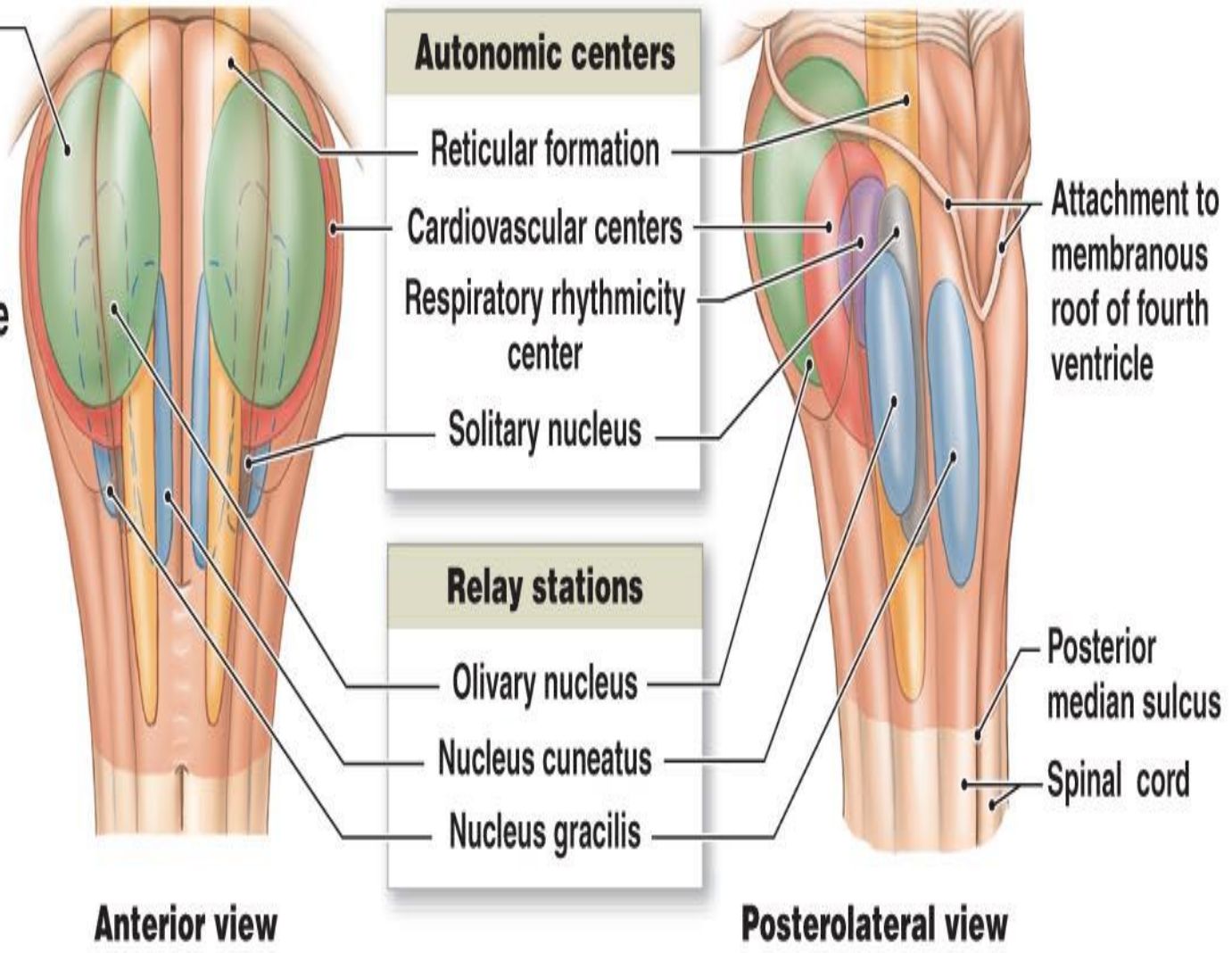
1. Cardiovascular centers
2. Respiratory rhythmicity centers
3. Additional Centers(Emesis التقيؤ, deglutition البلع, coughing السعال, hiccupping الحازوقة, and sneezing العطاس)

- **Sensory & motor nuclei of 5 cranial nerves:**
  Auditory/Vestibular (8), Glossopharyngeal (9), Vagus (10), Accessory (11), and Hypoglossal (12)
- **Relay nuclei**

1. Nucleus gracilis and nucleus cuneatus
2. Olivary nuclei relay from the spinal cord and brainstem to the cerebral cortex.


Pons
Medulla oblongata
Olive
Pyramids
Spinal cord
Olivary nucleus
Cardiovascular centers
Respiratory rhythmicity center
Solitary nucleus
Nucleus cuneatus
Nucleus gracilis
Reticular formation
Lateral white column
(a) Anterior view
Attachment to membranous roof of fourth ventricle
Posterior median sulcus
Posterior white columns
(b) Posterolateral view

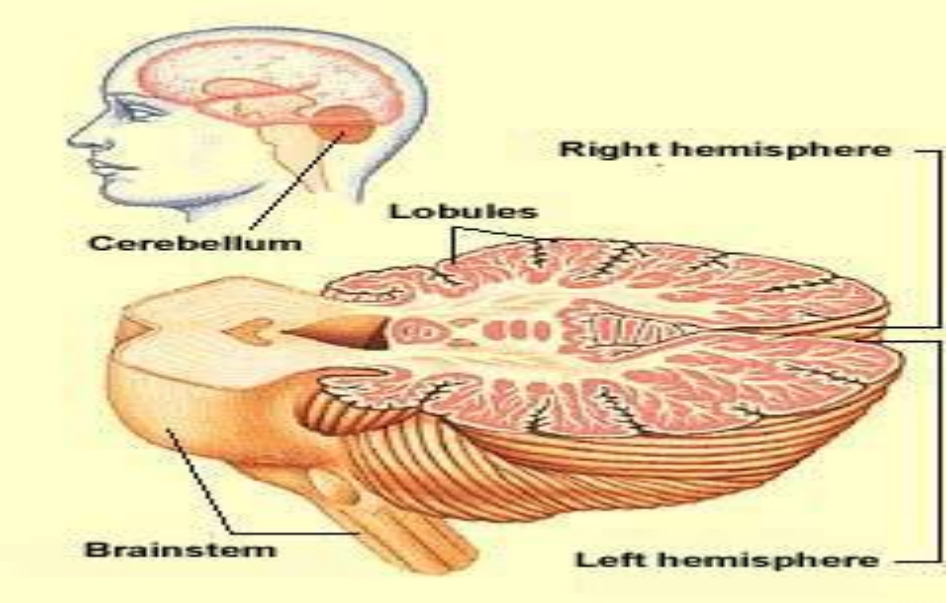
Structure of the medulla oblongata

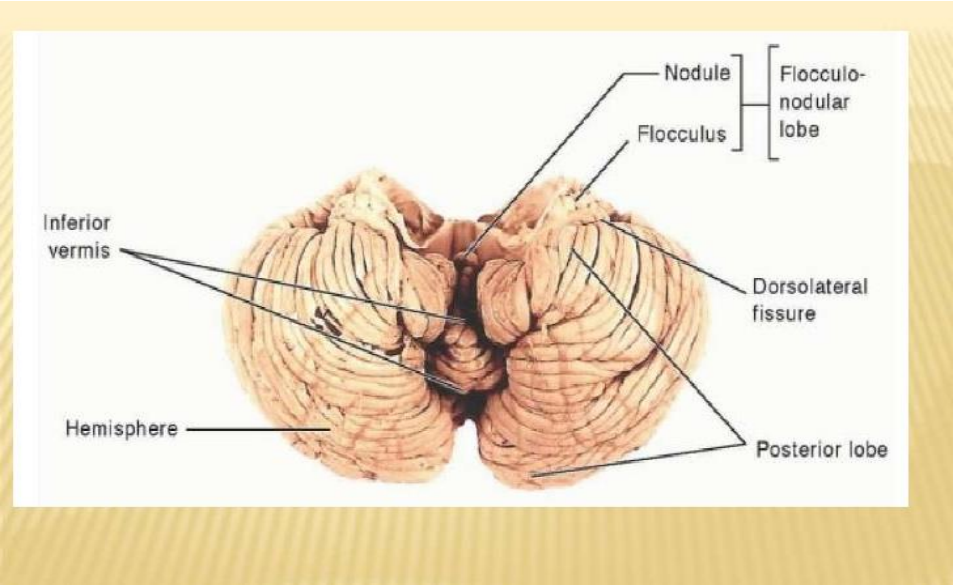


Two views of the structure of the medulla oblongata showing its landmarks and structures

The cerebellum

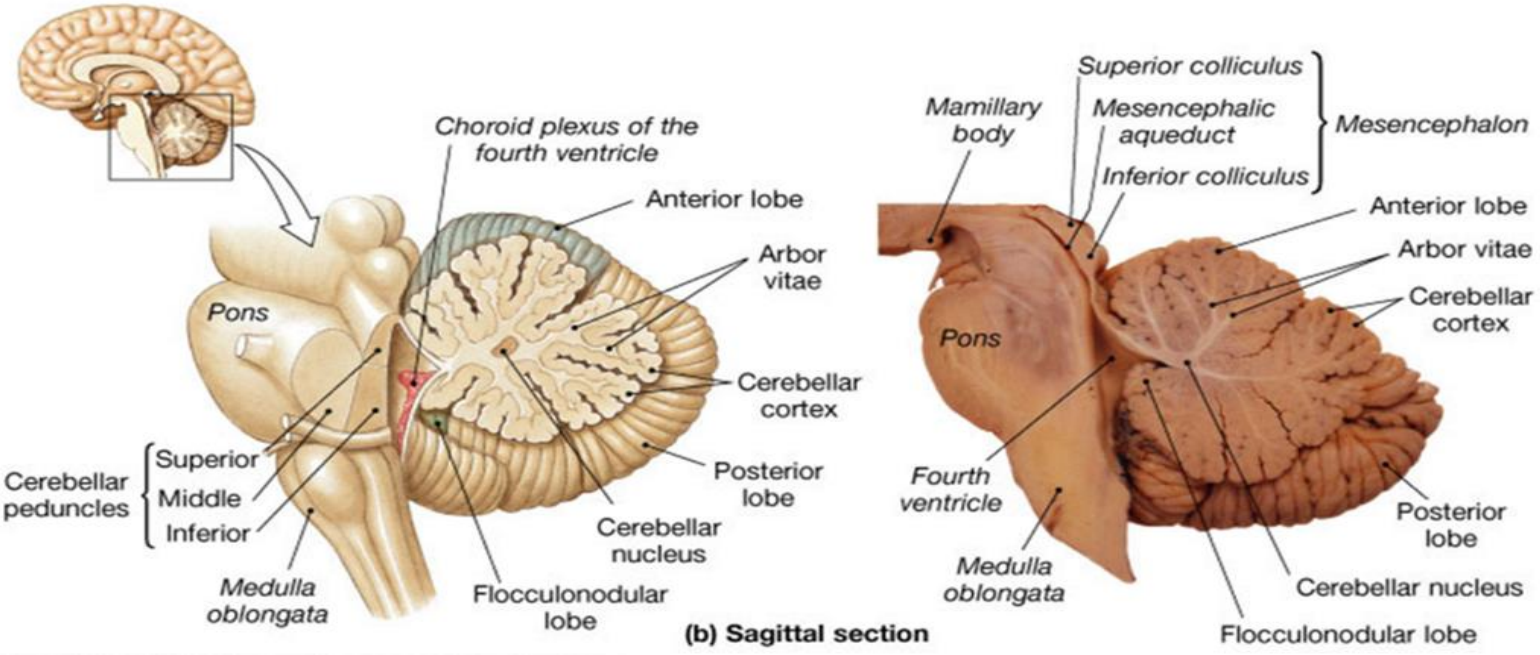
- lies within the posterior cranial fossa .
- is situated posterior to the pons and the medulla oblongata.
- consists of two hemispheres connected by a median portion(vermis) .





The cerebellum is connected to:

- the midbrain by the **superior cerebellar peduncles**,
- the pons by the **middle cerebellar peduncles**,
- the medulla by the **inferior cerebellar peduncles**.



- The cerebellum plays an important role in the **control of muscle tone** and **the coordination of muscle movement on the same side of the body.**