
بسم الله الرحمن الرحيم
السلام عليكم ورحمه الله وبركاته

Brain stem

Midbrain

Internal features

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

Intended Learning Outcomes (ILOs)

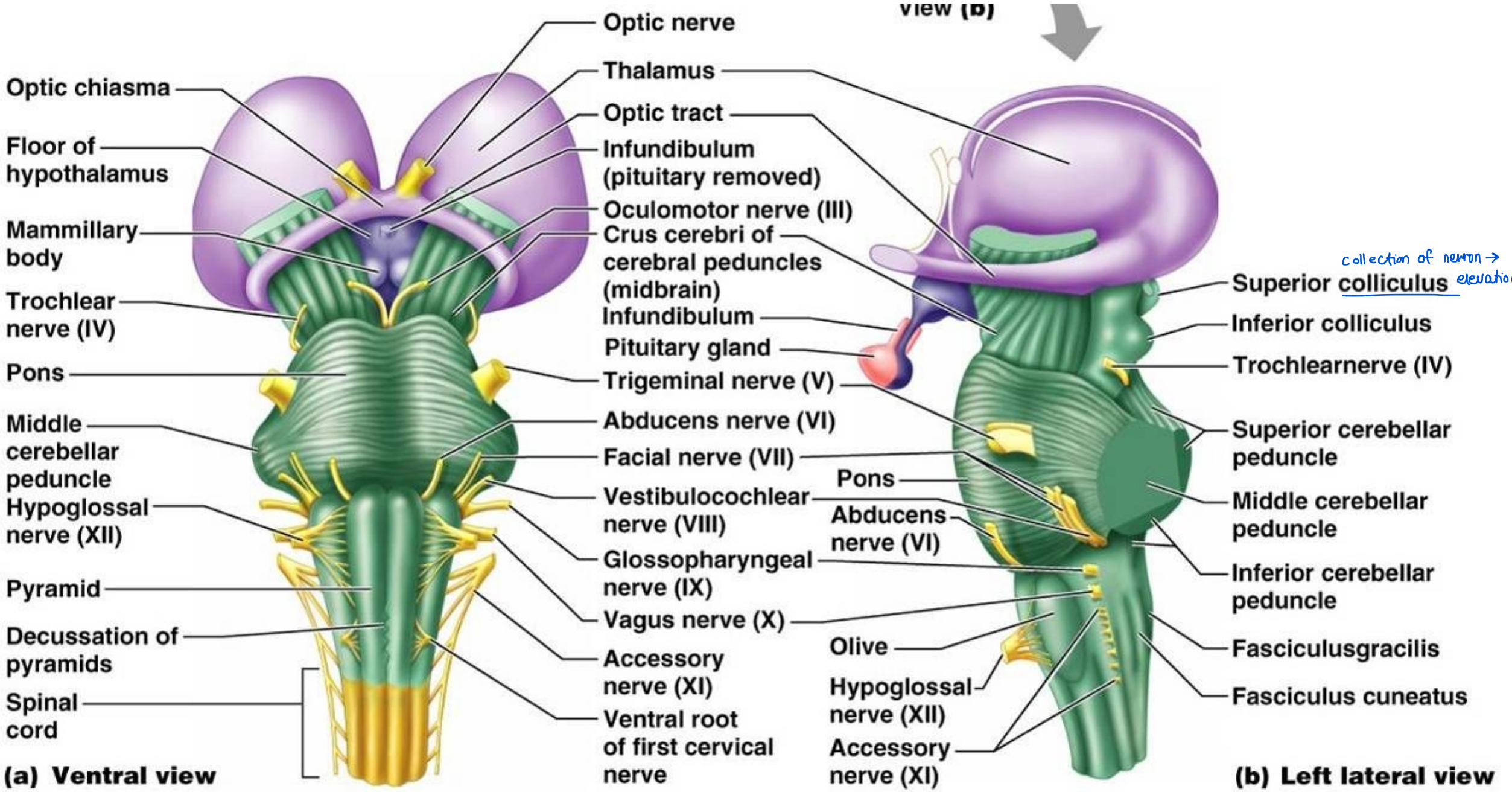
1. Identify parts of midbrain.
2. Recognize the nuclei of midbrain.
3. Recognize the tectum.

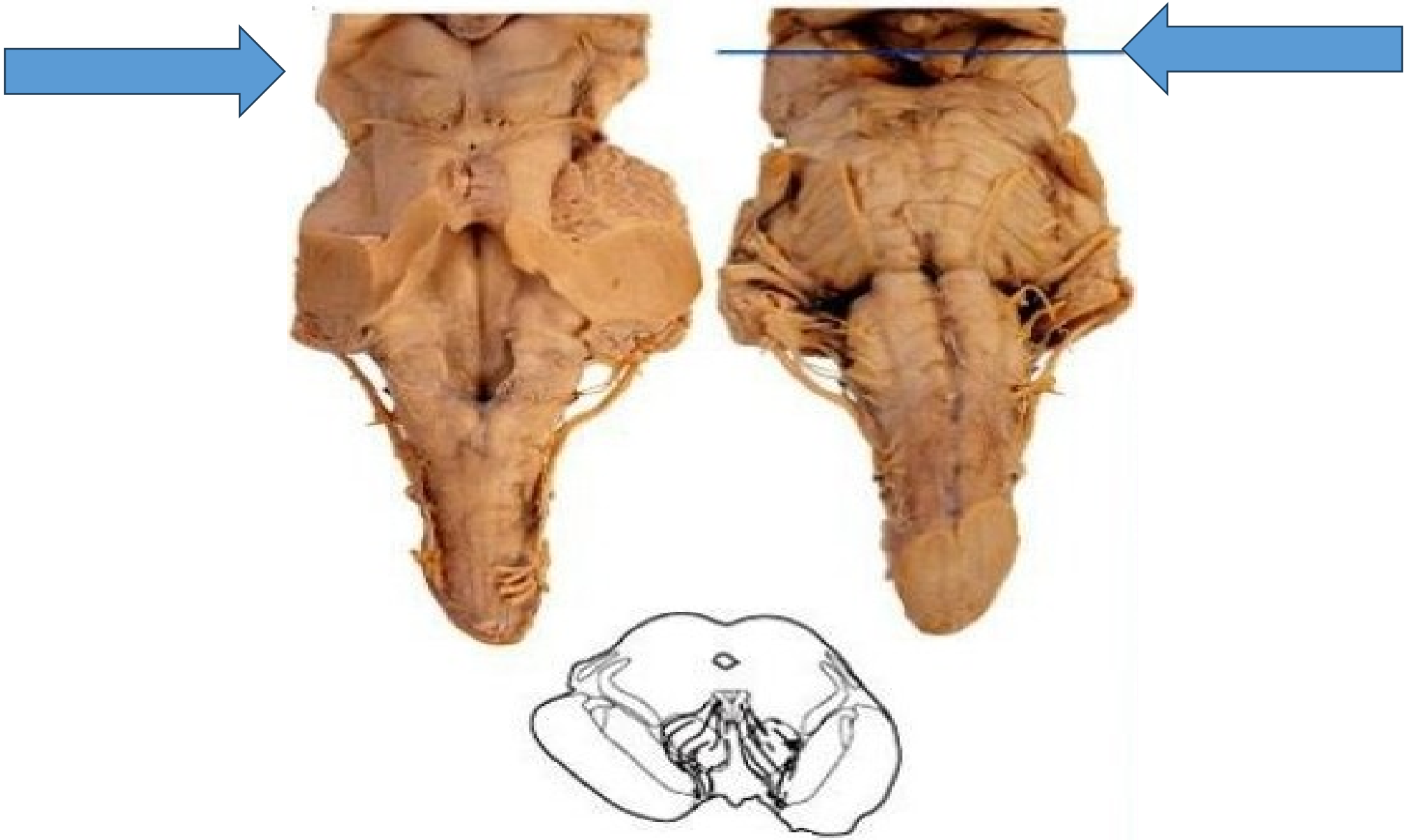
INTERNAL STRUCTURES OF THE MIDBRAIN

The aqueduct divides the midbrain into two parts:

Ventral part:
two cerebral peduncles

Dorsal part:
tectum





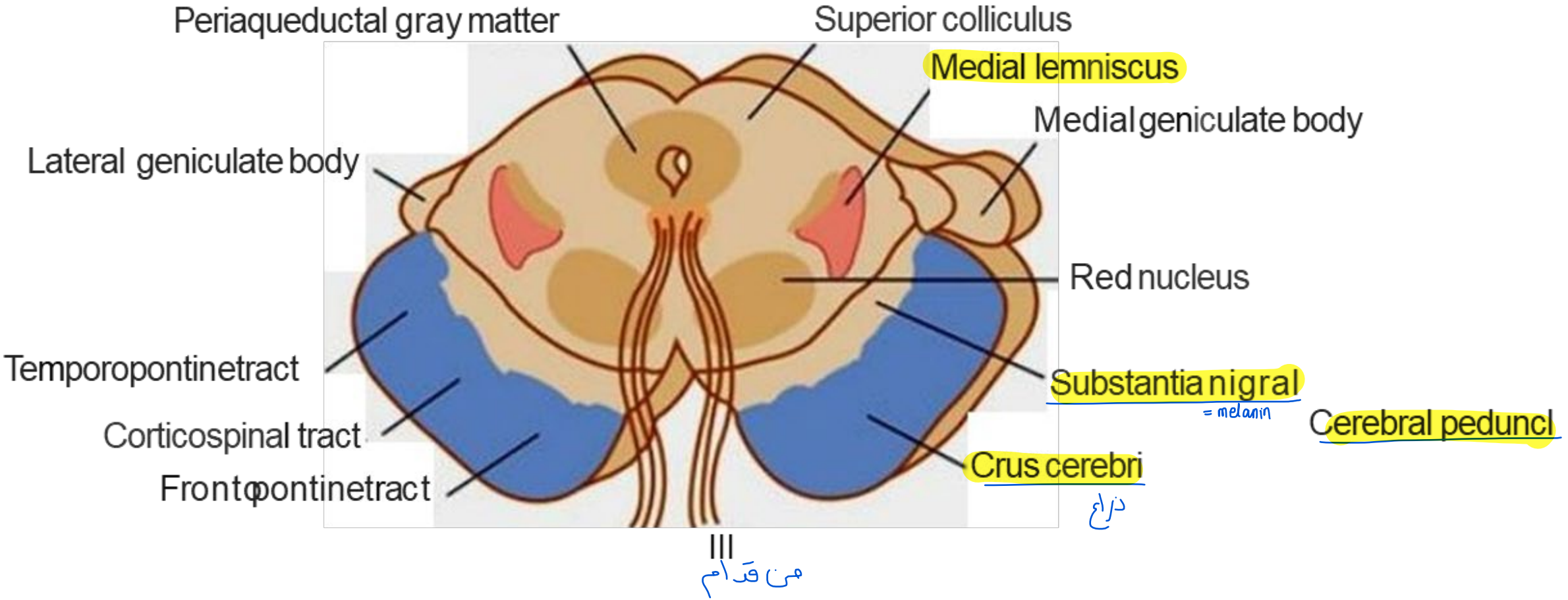
CEREBRAL PEDUNCLES

Each cerebral peduncle is divided into 3 parts:

1- Crus Cerebri

2- Substantia Nigra

3- Tegmentum



G. Upper midbrain; level of nerve III

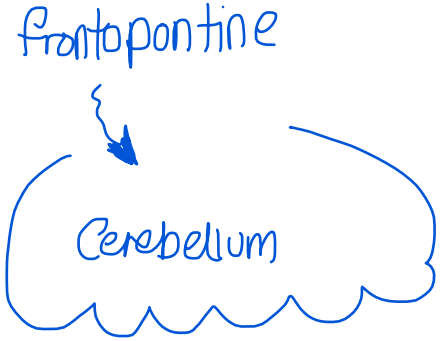
1- Crus Cerebri

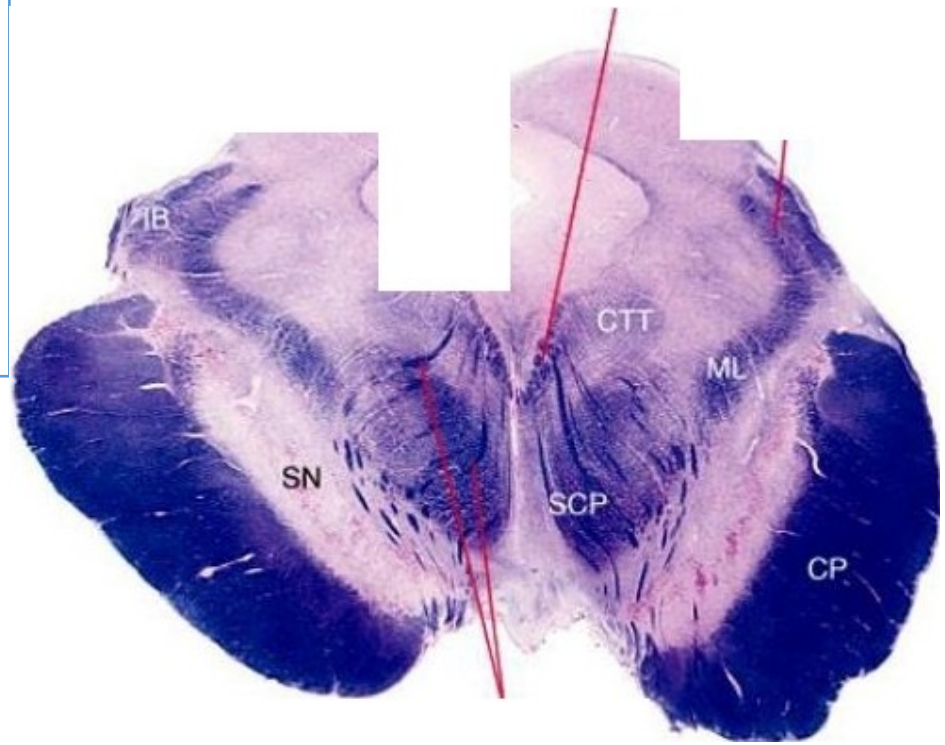
- It is the anterior part of the cerebral peduncle.
- It contain the following fibers:

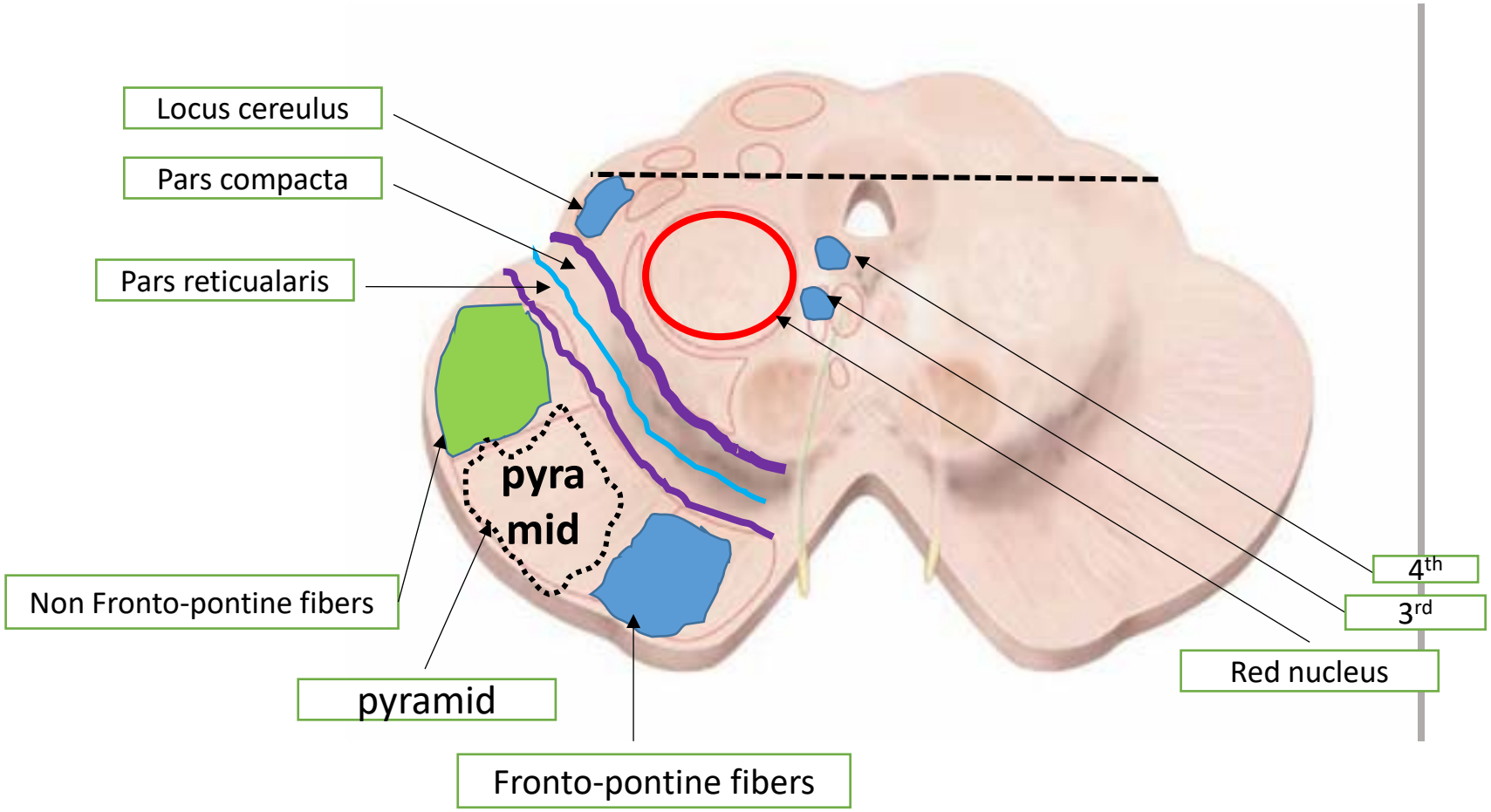
1- medial one fifth: frontopontine fibers.

2- lateral one fifth: non frontopontine fibers.

3- middle 3 fifths: corticospinal and corticobulbar fibers.







*Pontine nuclei
cerebellum الى تسلف لازم

2- Substantia Nigra

- It is one of the extrapyramidal motor nuclei.
- It is divided into 2 parts:

1- pars compacta:

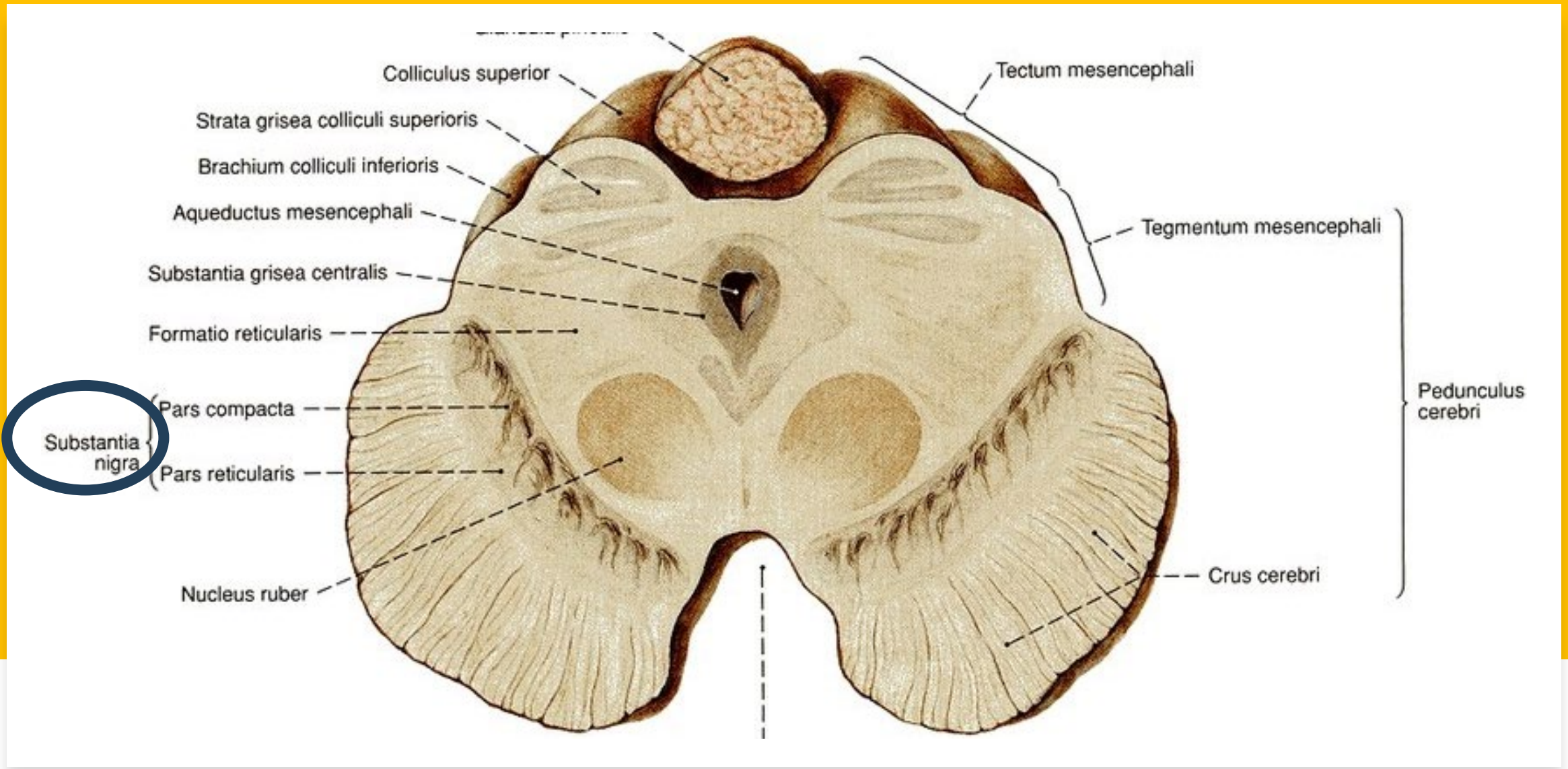
وراء ومضغوطة شوية

- posterior
- The nerve cells contain melanin pigment And secrete dopamine.

2- pars reticularis:

- anterior
- The nerve cells secrete GABA.

- Lesion: Parkinson's disease.


Colliculus superior
Strata grisea colliculi superioris
Brachium colliculi inferioris
Aqueductus mesencephali
Substantia grisea centralis
Formatio reticularis
Substantia nigra
Pars compacta
Pars reticularis
Nucleus ruber
Tectum mesencephali
Tegmentum mesencephali
Pedunculus cerebri
Crus cerebri

2- Substantia Nigra

It projects two types of inhibitory fibers:

- **Nigrostriate fibers:** They convey **dopamine** to the corpus striatum to inhibit the activity of the caudate nucleus.

- **Nigrothalamic fibers:** They convey **GABA** to the thalamus to inhibit the activity of the ventral anterior and ventral lateral thalamic nuclei.

3- Tegmentum

It contains tracts and nuclei

TRACTS

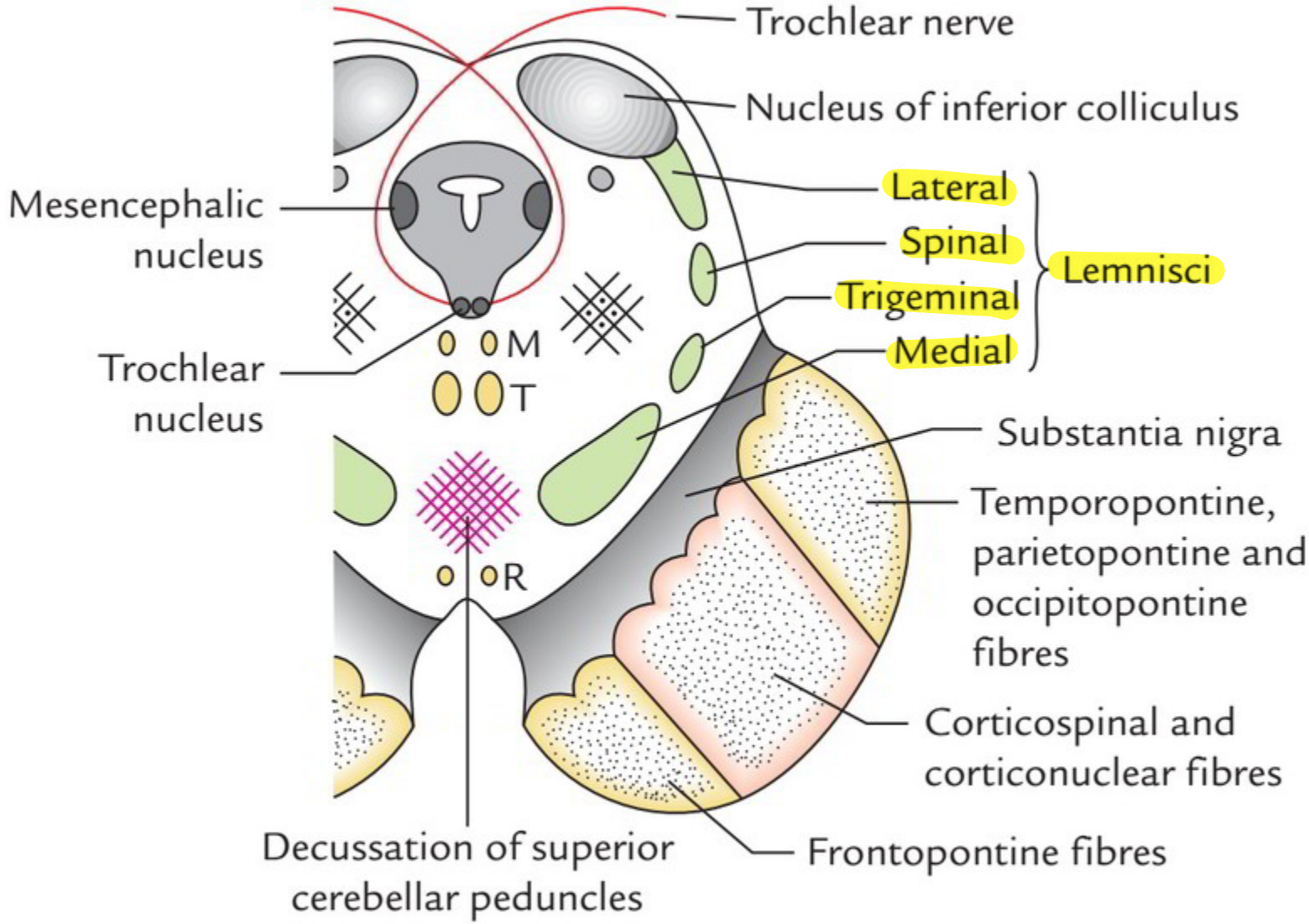
1-Four lemnsci:

medial lemniscus: conveys kinesthesia, discriminative touch and vibration from opposite side of the body. Gracile & Cunate

trigeminal lemniscus: conveys sensation from opposite side of the body.

spinal lemniscus: conveys pain, temprature from opposite side of the body. spinothalamic

lateral lemniscus: conveys auditory sensation to inferior colliculus from the two ears mainly the opposite side.


Trochlear nerve
Nucleus of inferior colliculus
Mesencephalic nucleus
Lateral
Spinal
Trigeminal
Medial
Lemnisci
Trochlear nucleus
M
T
Substantia nigra
Temporopontine, parietopontine and occipitopontine fibres
R
Corticospinal and corticonuclear fibres
Decussation of superior cerebellar peduncles
Frontopontine fibres

3- Tegmentum

It contains tracts and nuclei

Nuclei

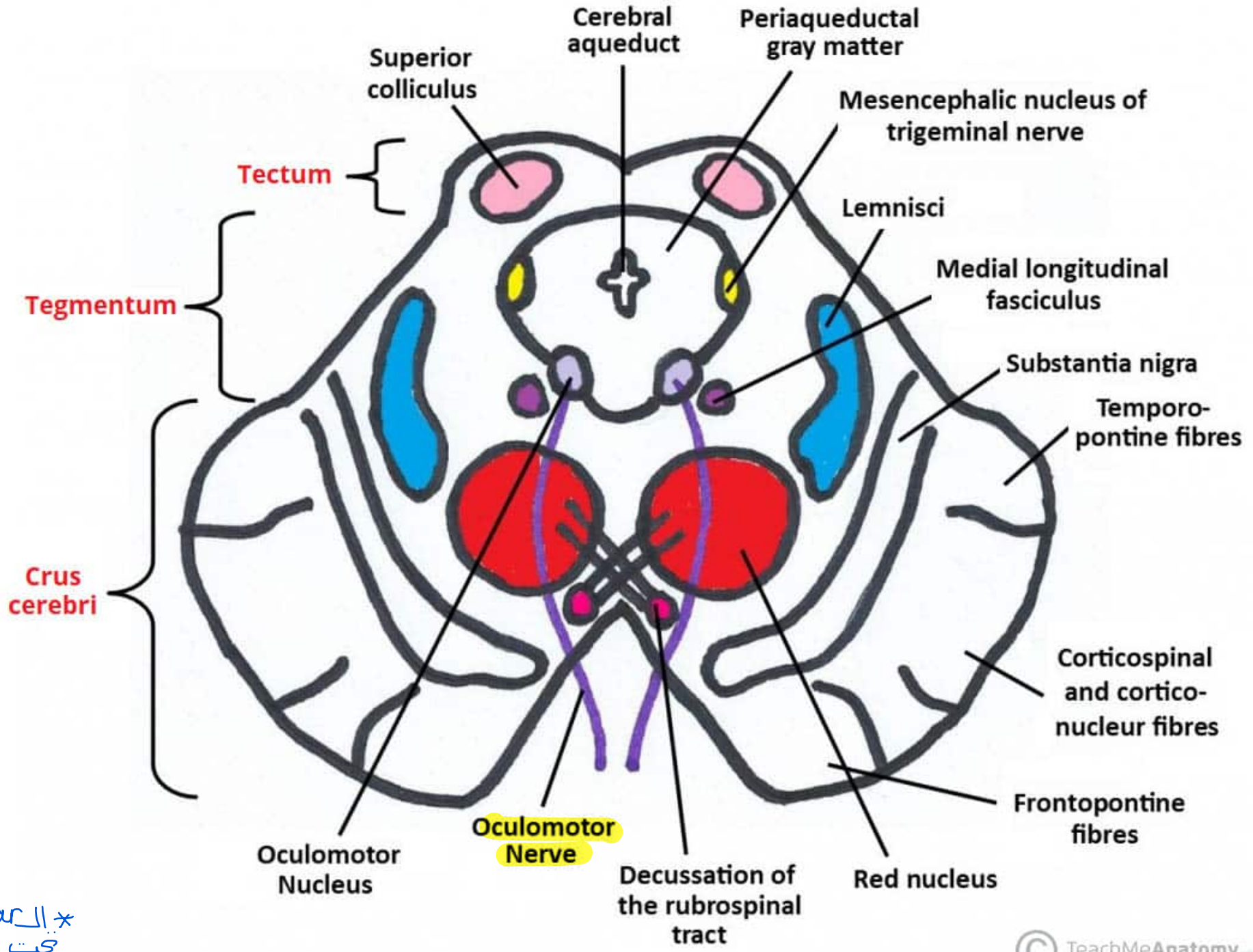
1- Nuclei of the cranial nerves: 3rd (at the level of superior colliculus) , 4th (at the level of inferior colliculus), 5th (mesencephalic nucleus) .

2- Other nuclei:

a. Red nucleus. Extrapyramidal motor nucleus, at the level of superior colliculus

a. Locus ceruleus: it is a pigmented area in the upper pons and lower midbrain (at the level of inferior colliculus), cells contain melaninpigments and secrete norepinephrine.

a. Reticular formation.



* trochlear النواة

Red nucleus

- It is an extrapyramidal motor nucleus.
- It relays motor impulses from the cerebral cortex and cerebellum to the thalamus & the spinal cord (cortico-rubro-spinal and dentato-rubro-spinal).

Input:

- Corticorubral tract: from the motor and premotor areas of the cerebral cortex.

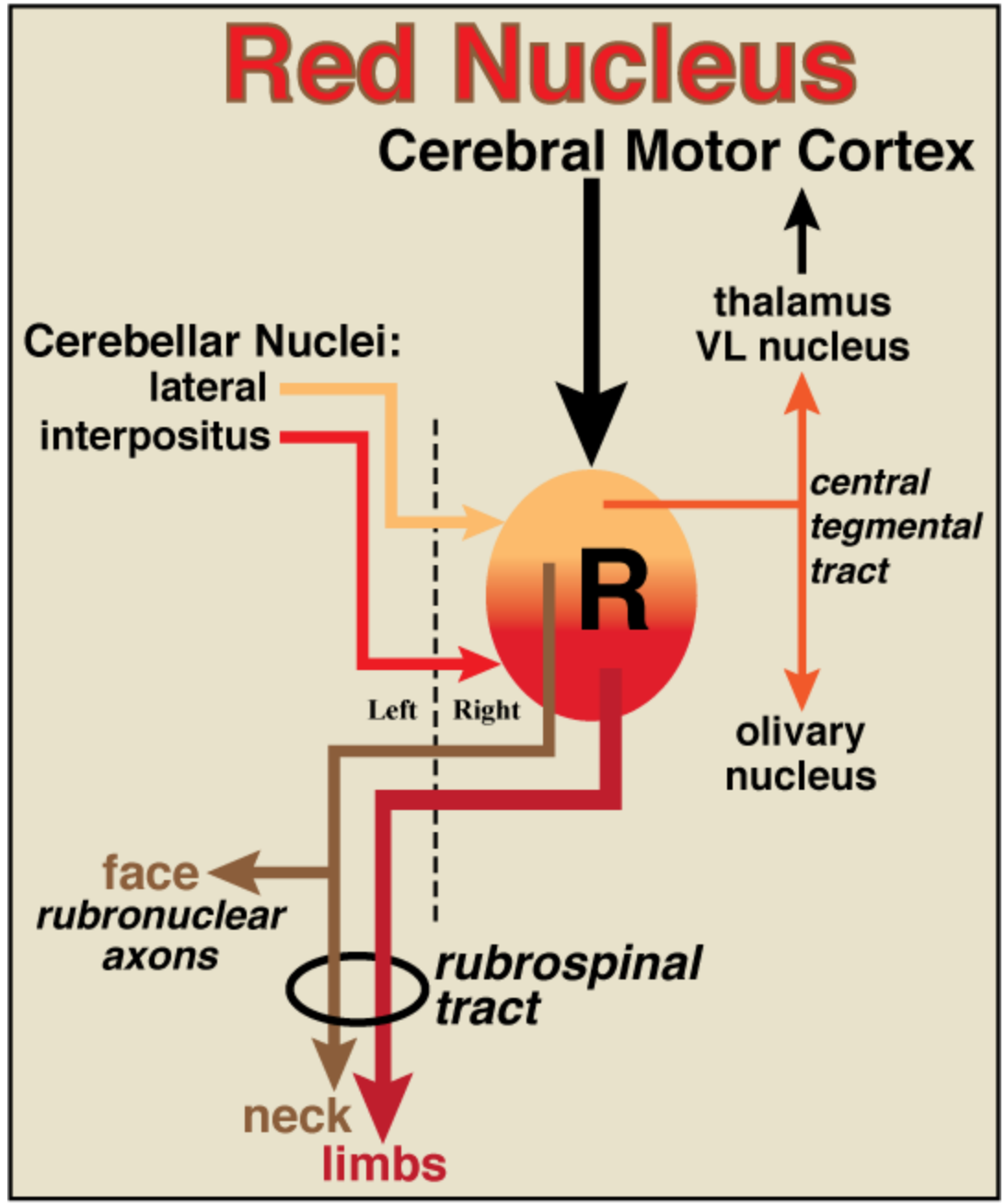
- Dentatorubral tract: from the opposite dentate nucleus of the cerebellum.

Output:

- Rubrospinal tract: to the spinal cord

- Rubrothalamic tract: to the motor nuclei of the thalamus (VA and VL nuclei).

Lesion: results in signs of cerebellar damage (contralateral tremor and ataxia).


Red Nucleus
Cerebral Motor Cortex
thalamus
VL nucleus
Cerebellar Nuclei:
lateral
interpositus
central
tegmental
tract
R
Left
Right
olivary
nucleus
face
rubronuclear
axons
rubrospinal
tract
neck
limbs

Lesions of the Midbrain

B- WEBER's Syndrome

Due to occlusion of posterior cerebral artery

Structure affected	Signs
Oculomotor nerve	**Ipsilateral ophthalmoplegia:** ➢ **Ptosis.** ➢ **External strabismus.** ➢ **Mydriasis.** ➢ **Loss of ipsilateral light reflex.**
Corticospinal artery pyramidal tract (Descending tract)	**contralateral hemiplegia**

Lesions of the Midbrain

B- BENEDIKT's Syndrome

Due to occlusion of posterior cerebral artery

Structure affected	Signs
Oculomotor nerve	Ipsilateral ophthalmoplegia: ➢ Ptosis. ➢ External strabismus. ➢ Mydriasis. ➢ Loss of ipsilateral light reflex.
Red nucleus	contralateral tremor and ataxia

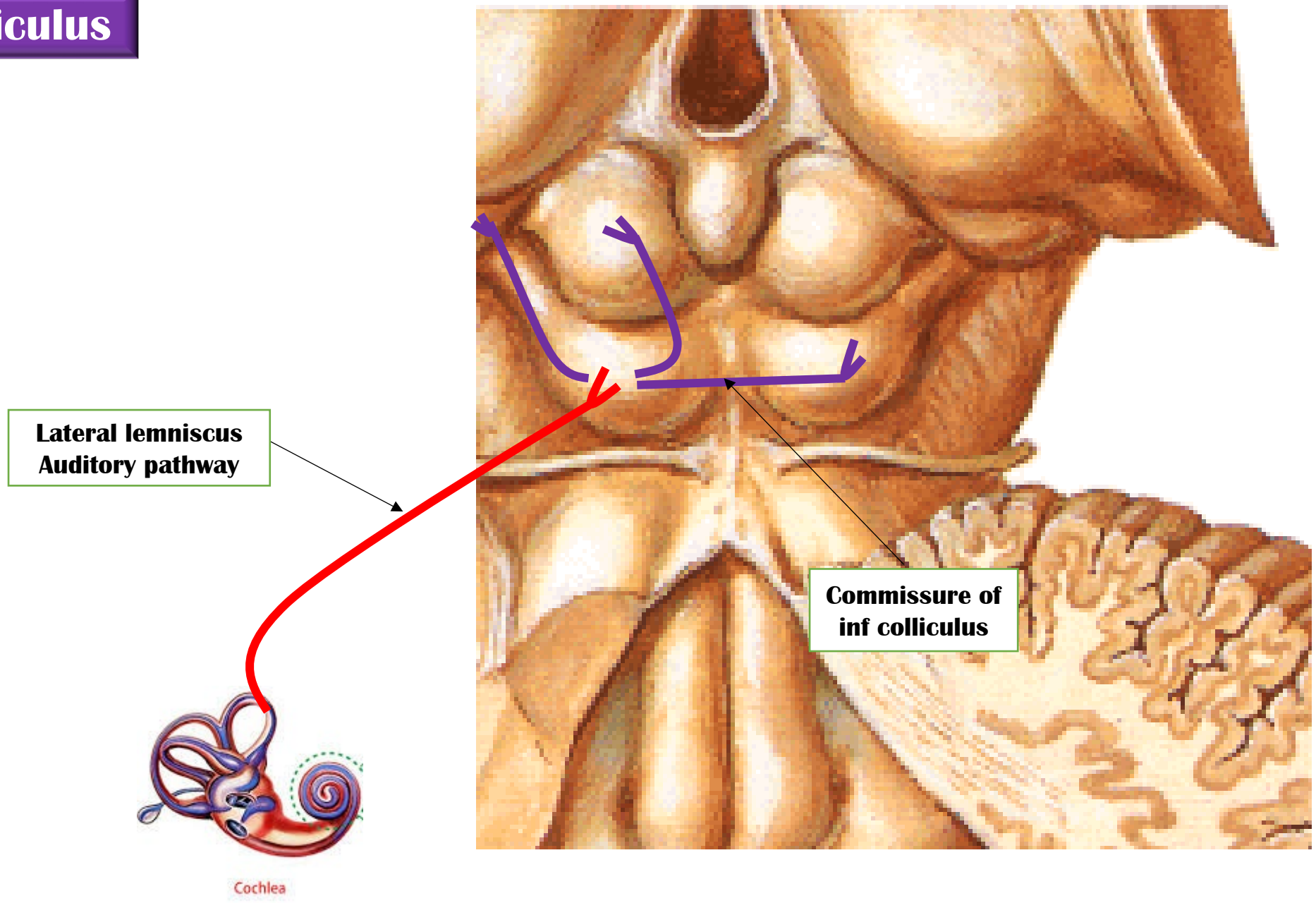
Dorsal part: Tectum

Four colliculi (corpora quadrigemina): 4 rounded elevations
Two superior colliculi
Two inferior colliculi.

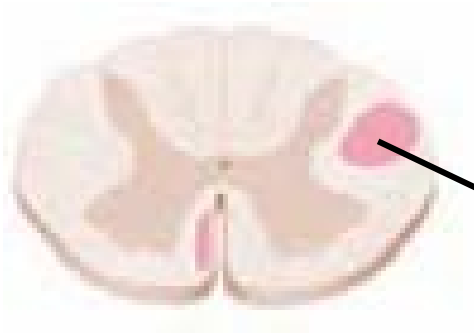
حفظ
SAQ

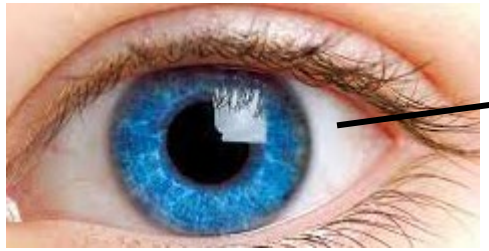
	Superior colliculus	Inferior colliculus
Connection to the opposite side	Connected by posterior commissure	Connected by commissure of inferior colliculus
Connection to the thalamus	Connected to lateral geniculate body by superior brachium	Connected to medial geniculate body by inferior brachium MCQ
Function	➢ It is not relay nucleus in the visual pathway. ➢ An important visual reflex center. ➢ An auditory reflex center.	➢ A relay nucleus in the auditory pathway. ➢ An auditory reflex center for reflexes associated with sound
		center - reflex center

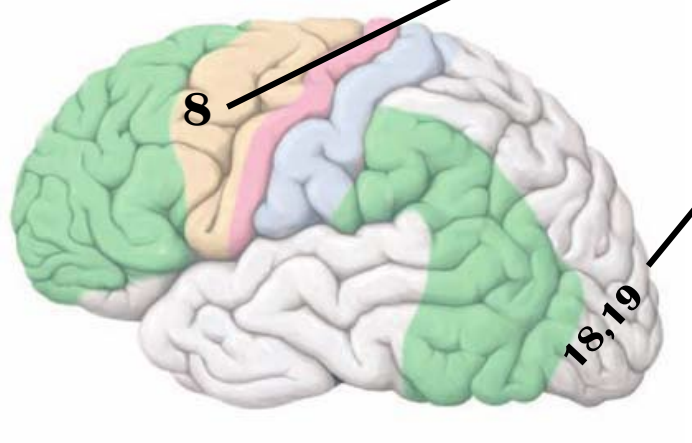
Inferior colliculus

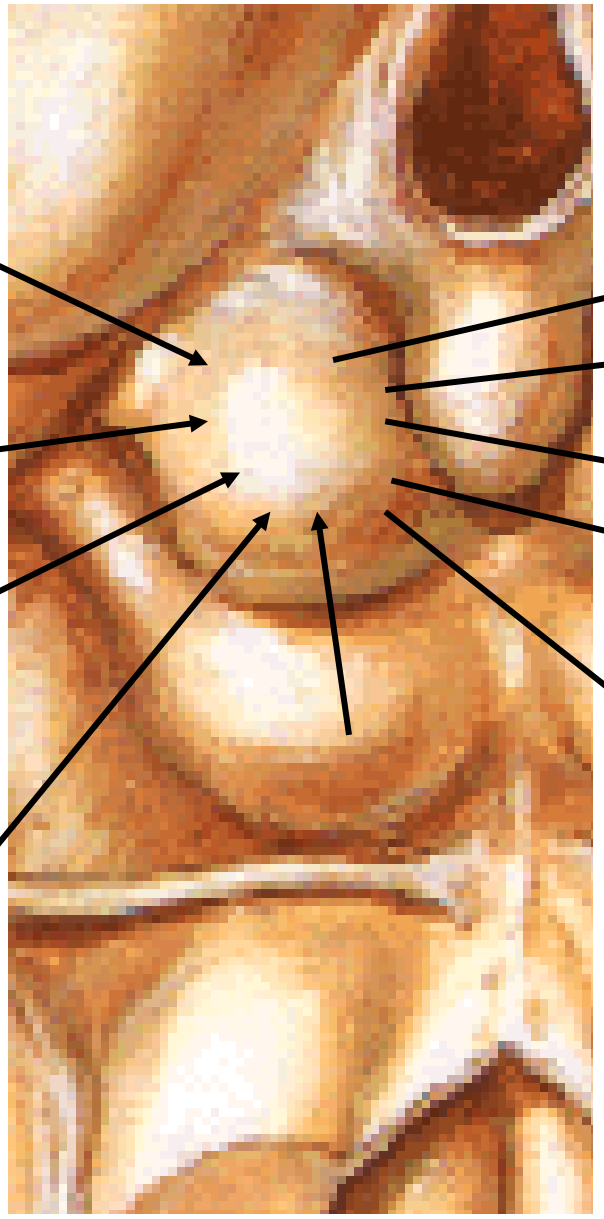


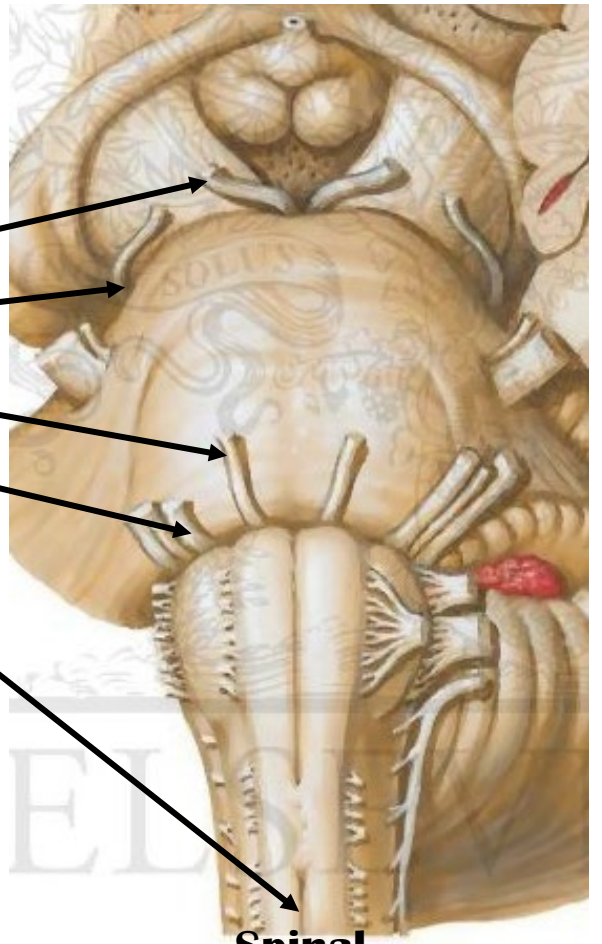
Superior colliculus











Spinal cord

Notes of Dr.Ahmed Gamal L9

MCQ :
- Crus cerebri & contents (frontopontine - non frontopontine)
- Substantia nigra (parts & secrete)

SAQ :
- Enumerate leminsci ?
- Enumerate Nuclei ?
- Lesion of red nucleus ?
- Combare () superior & inferior colliculs ?