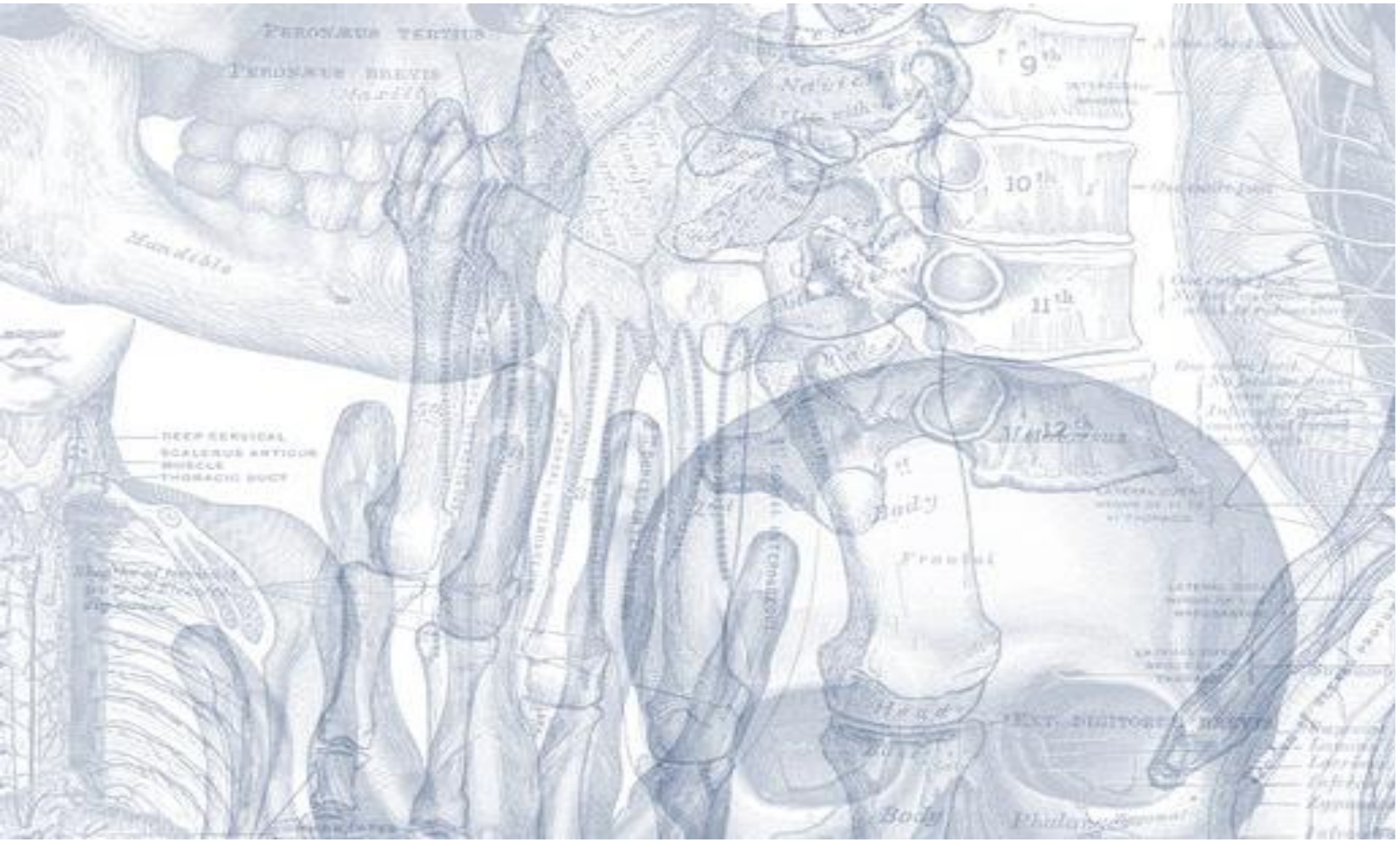
بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ



ANATOMY
TEAM 436

436
MEDICINE
KING SAUD UNIVERSITY

OSPE

NEUROPSYCHIATRY BLOCK

For the PowerPoint version click here.

References:

1- Team **435**

2- Prof. Fathallah's Revision Slides (view)

3- Neuroanatomy

4- TeachMeAnatomy.info

IMPORTANT POINTS: PLEASE READ THEM!

- The exam is composed of **7 questions**:

  5 Anatomy

  1 Histology

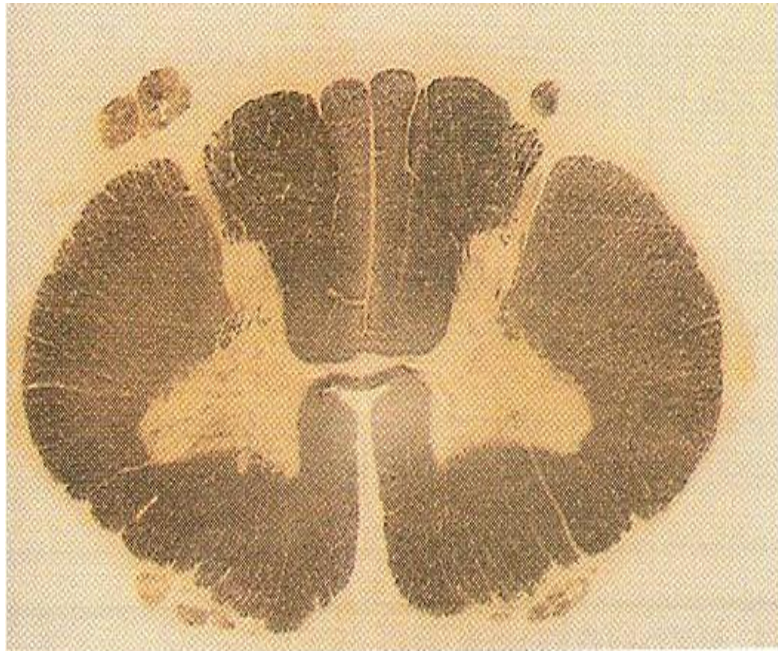
  1 Radiology: 1 CT or 1 MRI
- Please **READ** the question **CAREFULLY** before answering because not all the questions are just identification.
- There is a **difference between the name of gyrus** (e.g. precentral gyrus) and the **name of the functional of area** (e.g. primary motor area)
- The illustrations in these slides are not necessarily those will be present in the exam.
- The information you have obtained for MCQ exam are more than enough for OSPE.
- Practice the correct **SPELLING** and write the **FULL** name of the structures.

اللهم لا سهل إلا ما جعلته سهل وأنت تجعل الحزن إذا شئت سهل

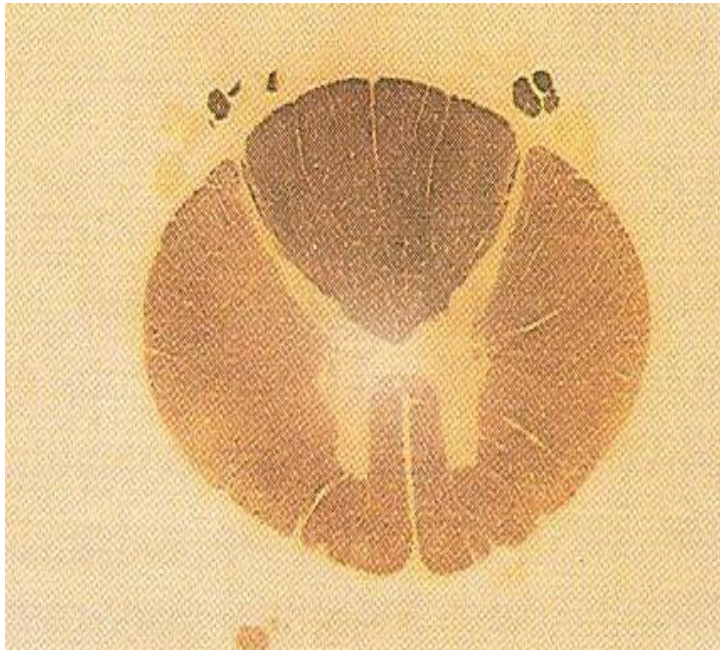
Spinal Cord Section

You should be able to:

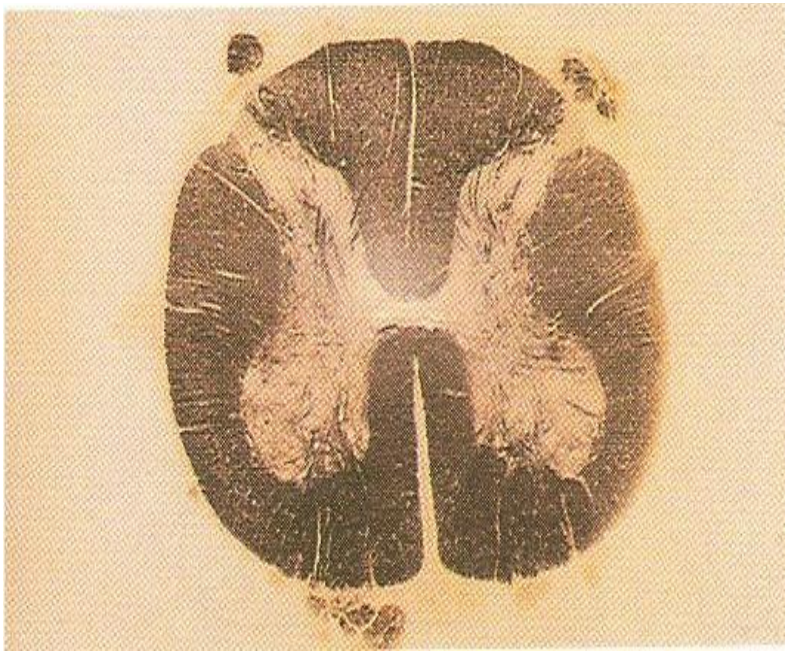
- Identify the **level.**
- Identify the **structures** found in the slide.



Cervical



Thoracic



Lumbar

(EXTRA) How to differentiate between the sections?

Feature	Cervical	Thoracic	Lumbar
Shape	Oval (or kidney shaped)		Round
Dorsal Horn	Very thin	most characteristic feature **Lateral** horn **present**	Thicker
Ventral Horn			
Lateral Horn	NO		NO
Fasciculus Gracilis	Present		Present
Fasciculus Cuneatus	Present		NO

Features to look for to identify a cord section:

- Is there a large ventral horn?
  - Yes → C_5–T_1, or L_2–S_2
  - No → T_2–L_1, C_1–C_4
- Are both dorsal columns present?
  - Yes → Above T_5
  - No → Below T_5
- Is there a lateral horn present?
  - Yes → T_1–L_2
  - No → C_1–C_8 or L_3–S_5

Note

In Argyll Robertson pupil, the pupil reacts to accommodation but not to light.

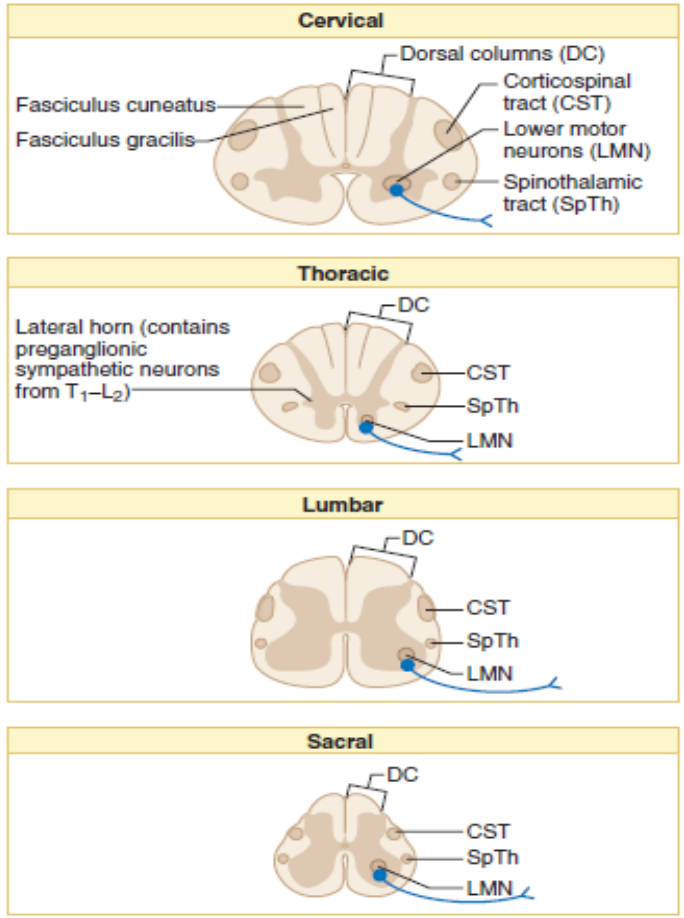
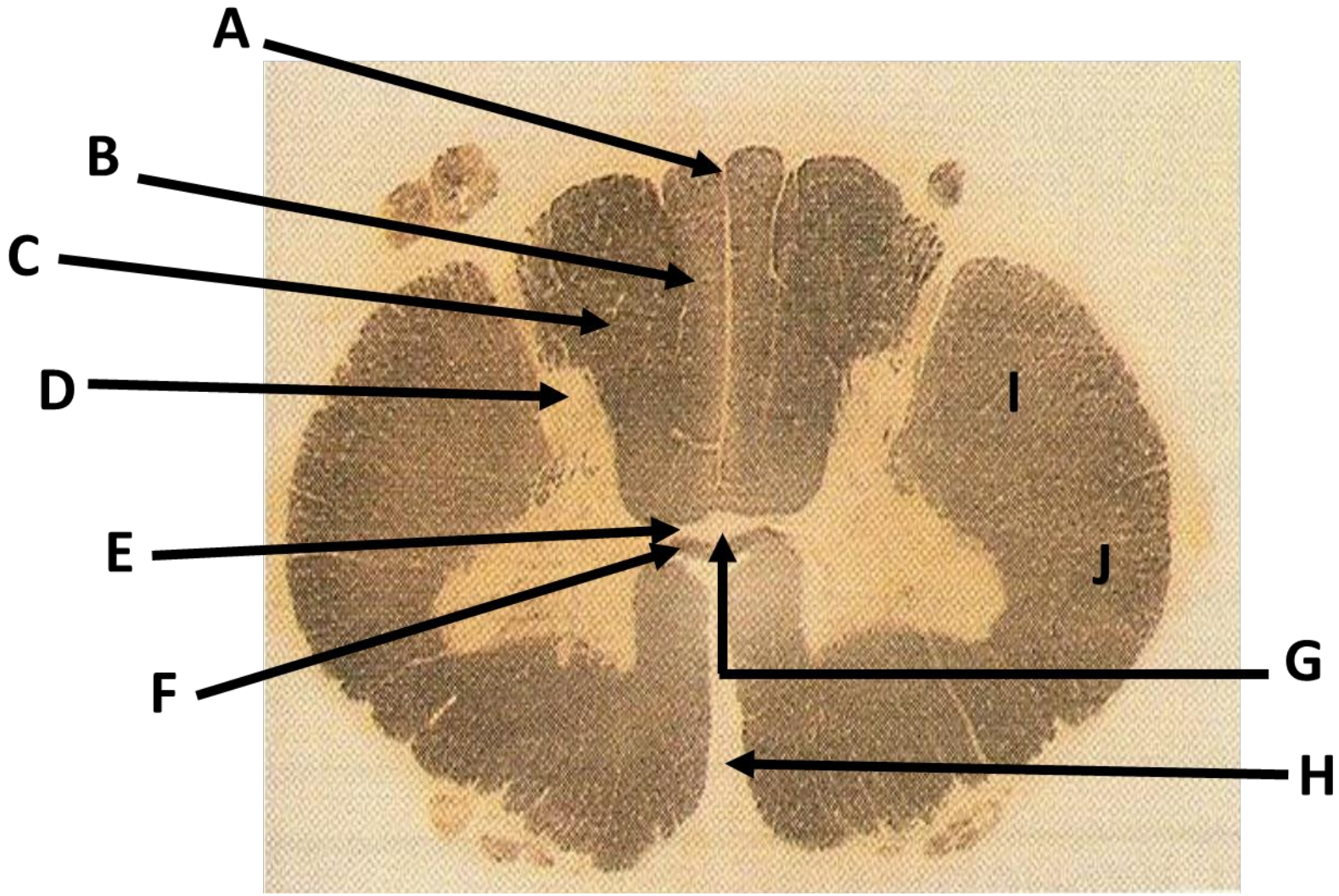


Figure III-4-16. Spinal Cord: Levels

Spinal Cord Section

CERVICAL

A. Posterior median sulcus
B. Fasciculus gracilis
C. Fasciculus cuneatus
D. Dorsal horn of grey mater
E. Grey commissure
F. White commissure
G. Central Canal
H. Anterior median fissure
I. Corticospinal tract
J. Spinothalamic tract



Note: **NO** lateral horn

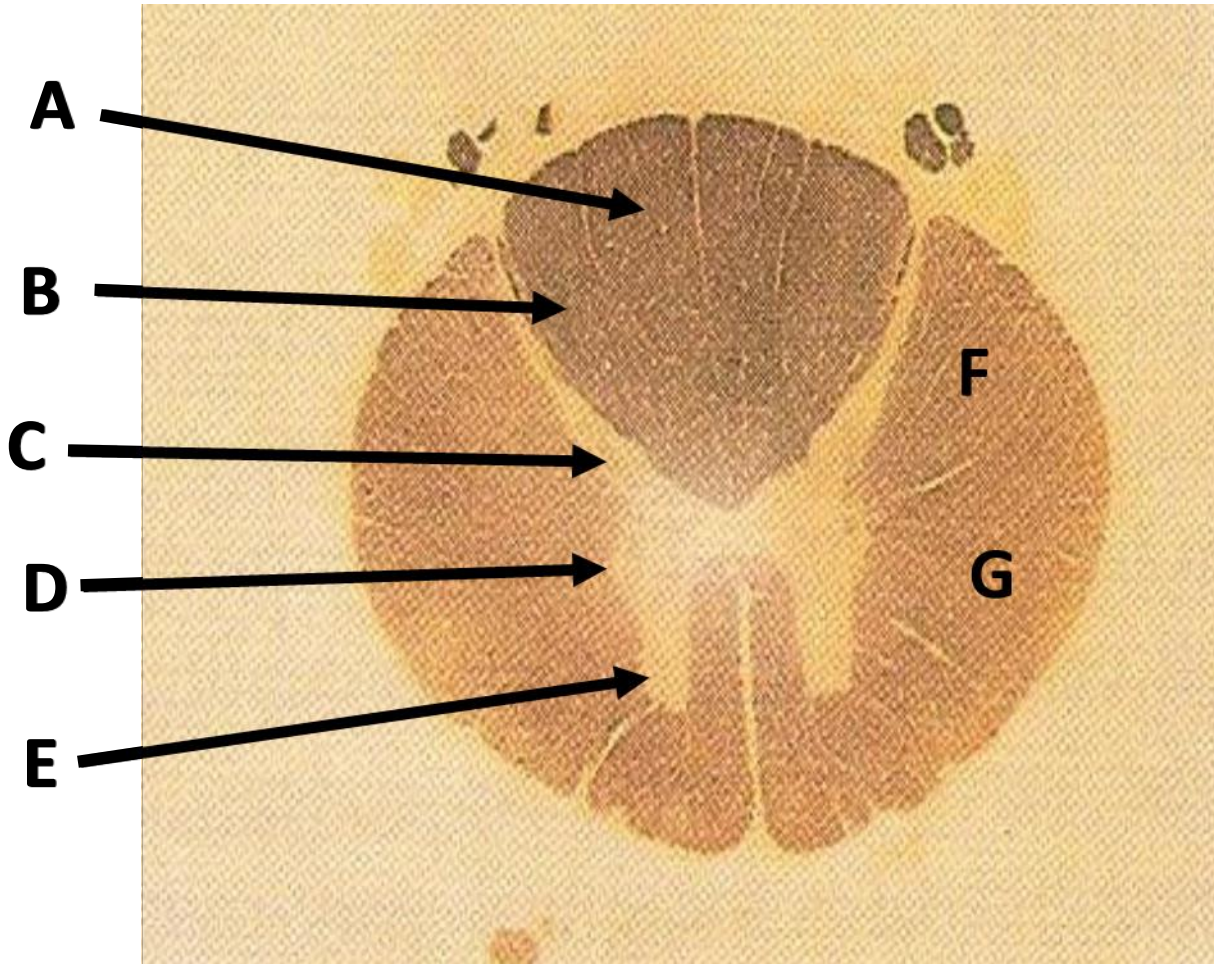
Spinal Cord Section

THORACIC

A. Fasciculus gracilis
B. Fasciculus cuneatus
C. Dorsal horn of grey mater
D. Lateral horn of grey mater
E. Ventral horn of grey mater
F. Corticospinal tract
G. Spinothalamic tract

Level of section: T1 – T6

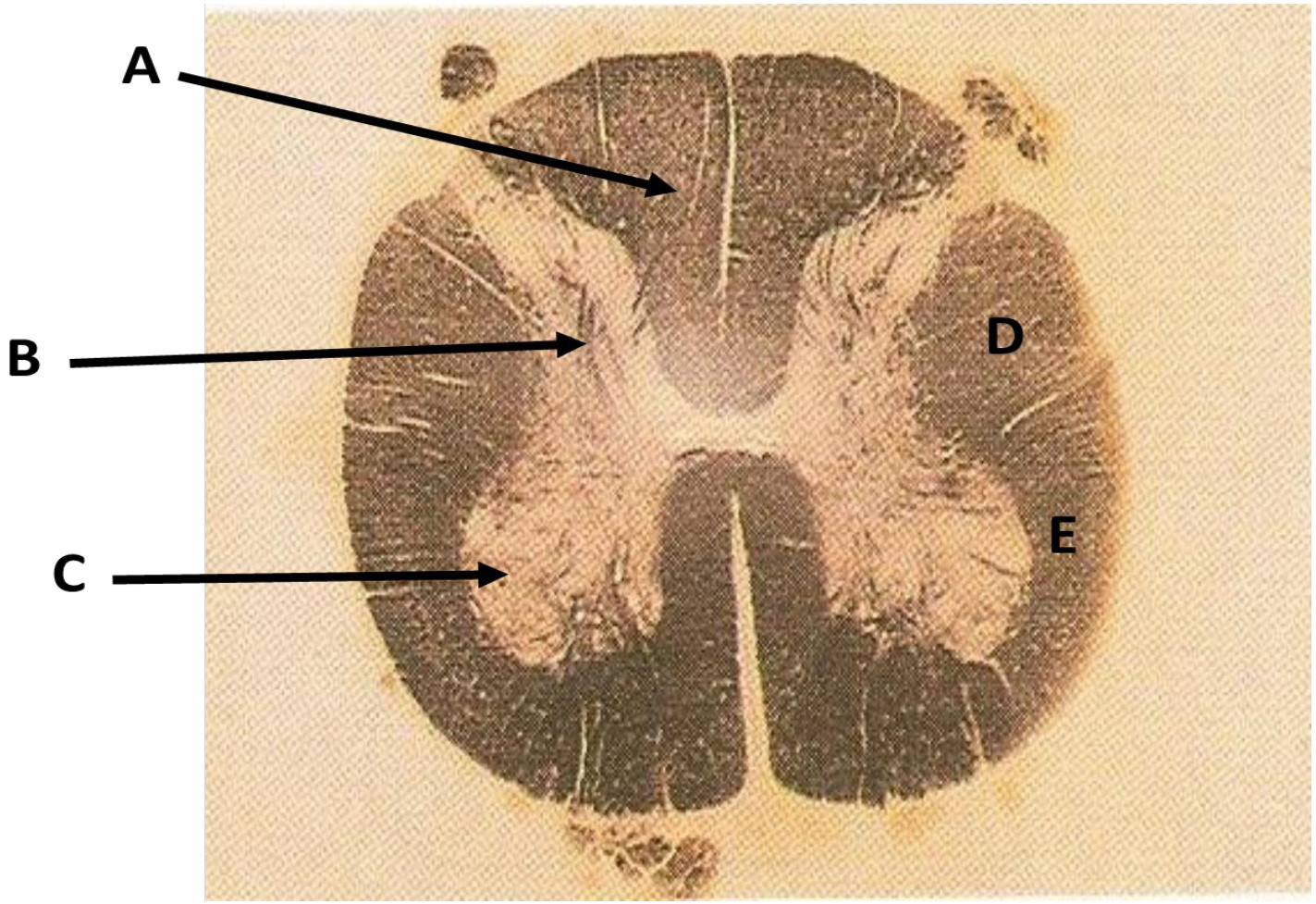
How do I know?
This cut contains both gracilis (lower limbs) and cuneatus (upper limbs)
Source: Snell's Clinical Neuroanatomy



Spinal Cord Section

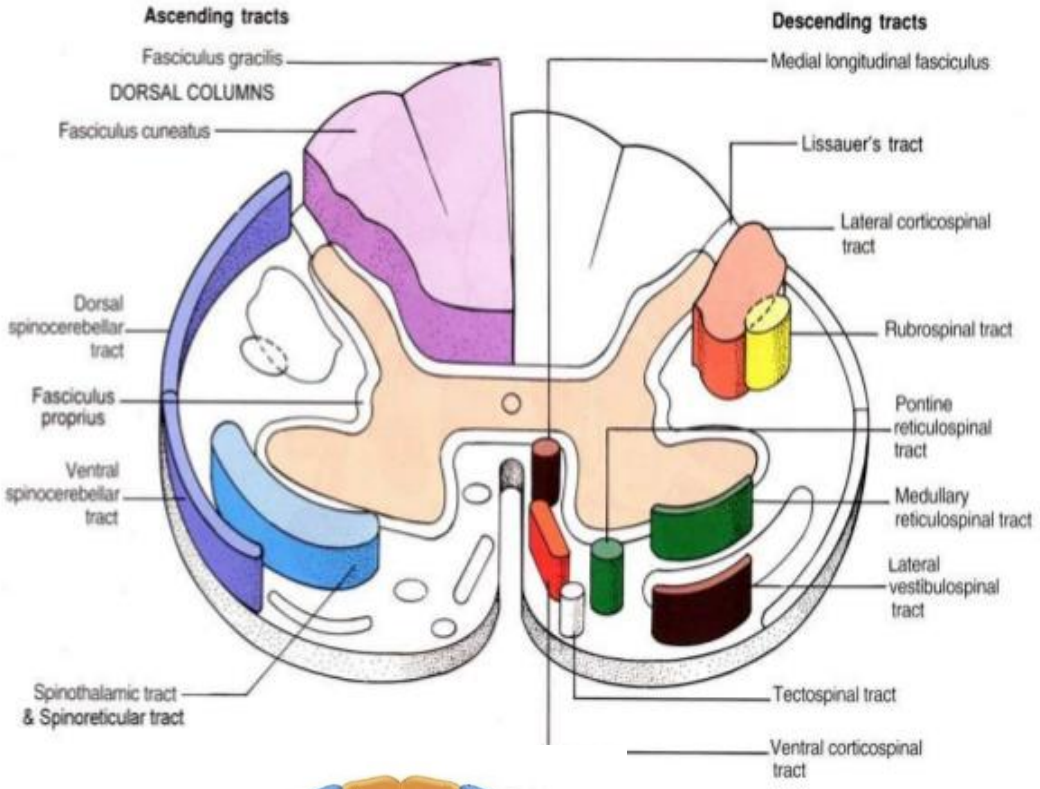
LUMBAR

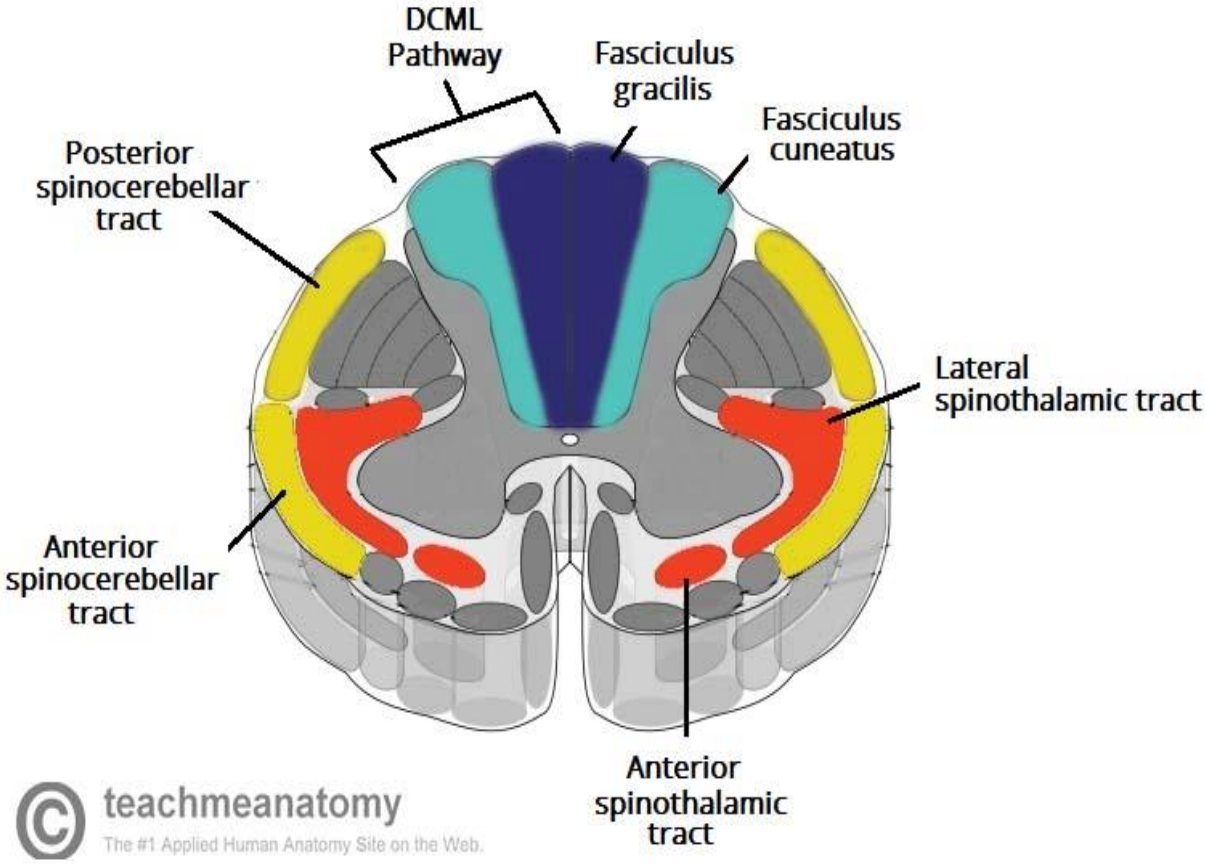
A. Fasciculus gracilis
B. Dorsal horn of grey mater
C. Ventral horn of grey mater
D. Corticospinal tract
E. Spinothalamic tract

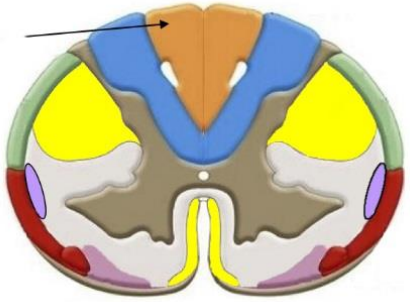


Note: **NO** fasciculus cuneatus

(EXTRA) Recall the tracts:

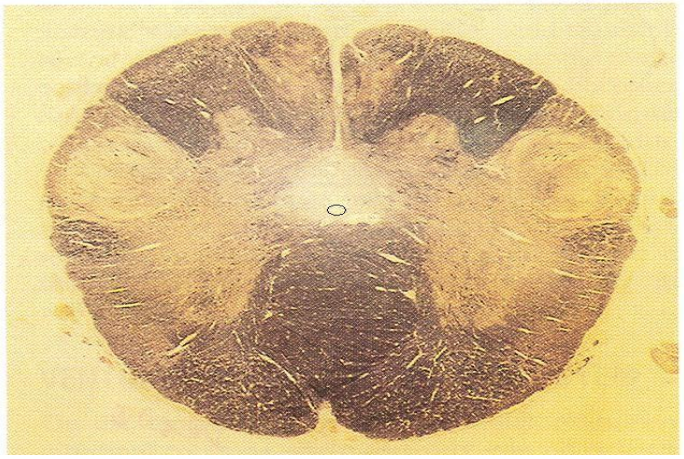




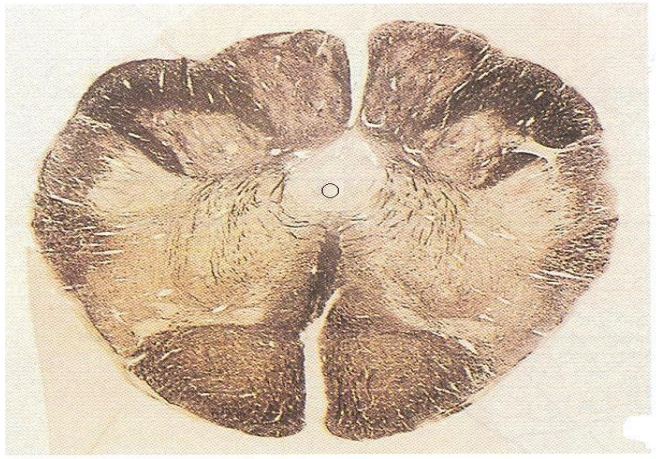


Can you tell from which segment these slides are from? **cervical**

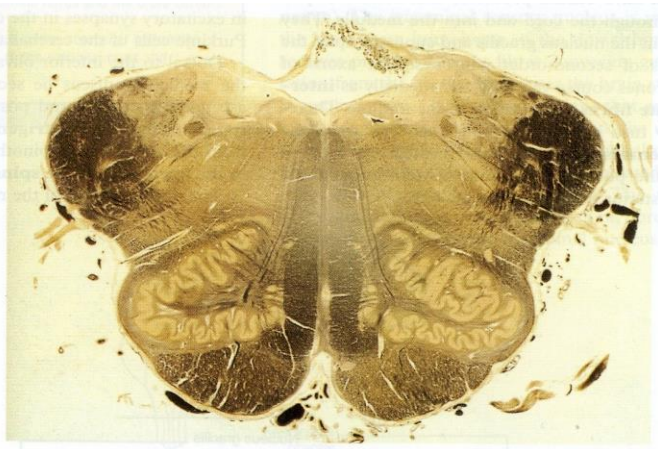
Internal Structures of Brainstem



Caudal medulla:
(Level of pyramidal decussation)



Mid medulla:
(Level of sensory decussation)

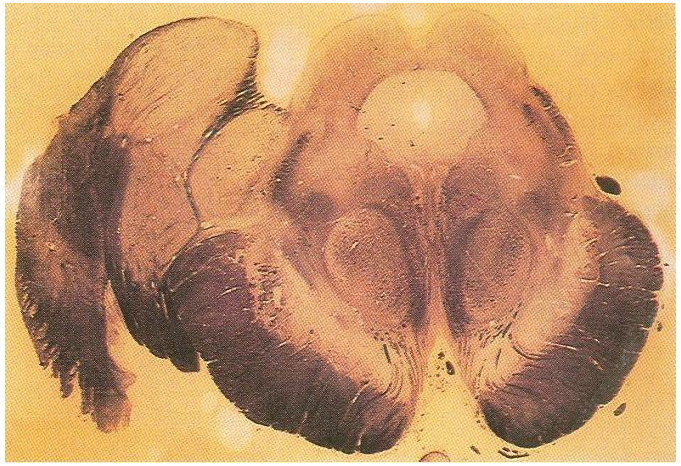


Rostral medulla:
(level of inferior olivary nuclei)

You should Know:

- What is the level?
- Identification for each section?
- Internal structure?

Midbrain:
(Level of inferior colliculus)



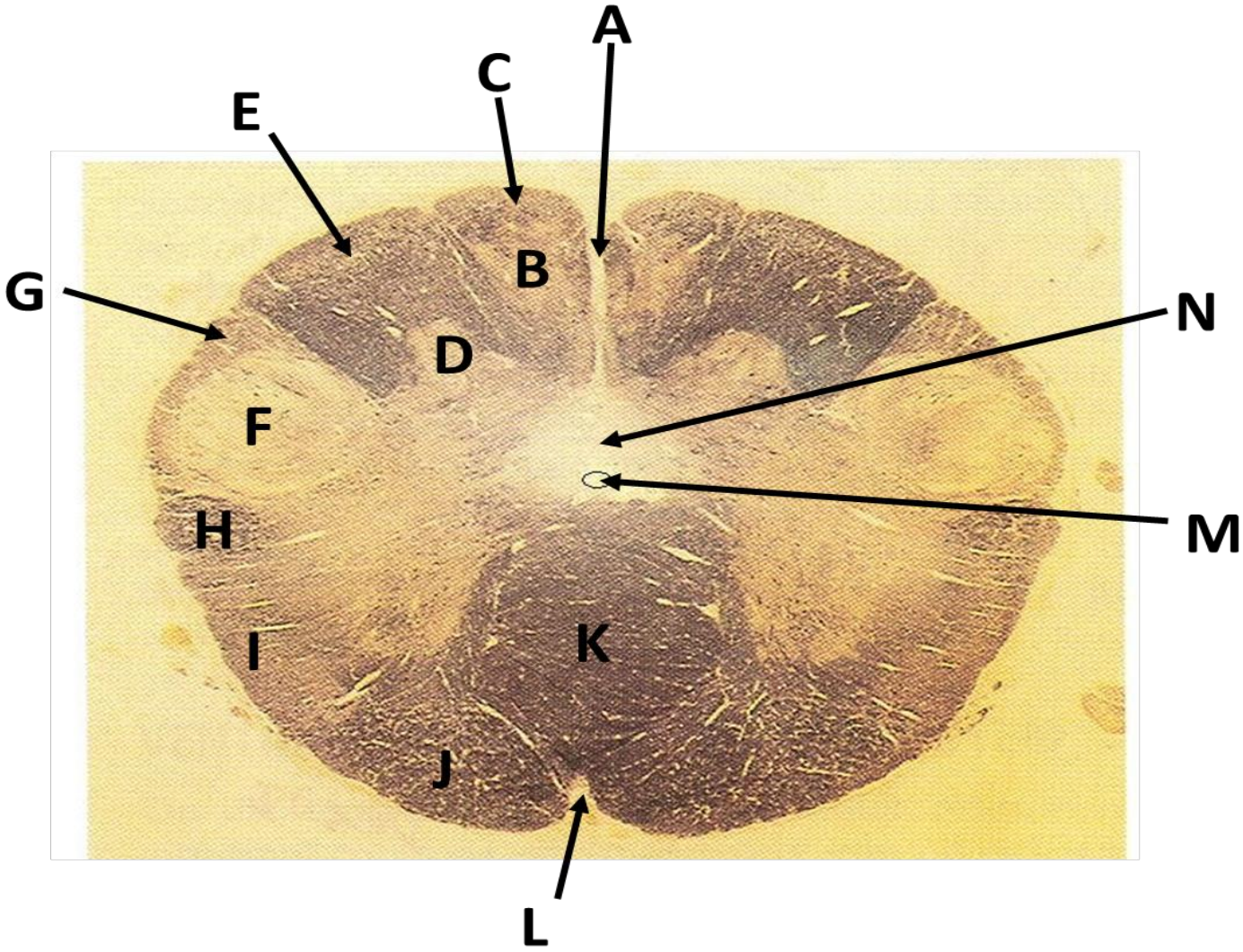
Midbrain:
(Level of superior colliculus)

Internal Structures of Brainstem

Section: **Caudal Medulla**

Level of: **Pyramidal Decussation**

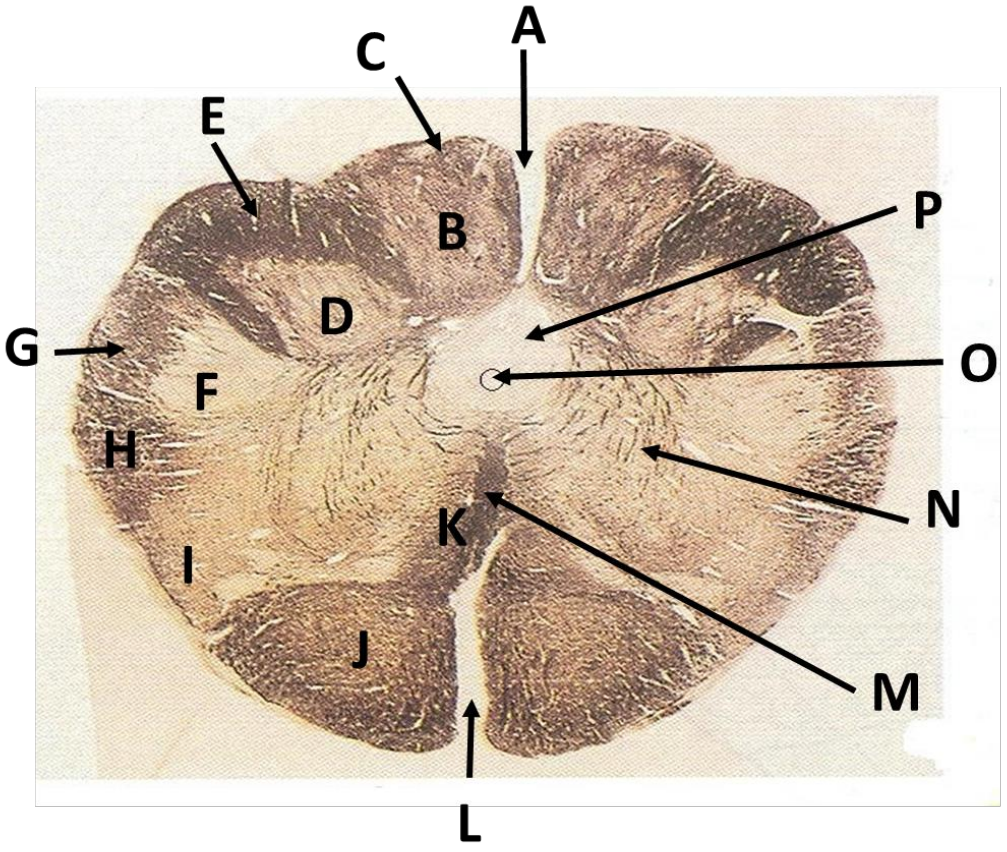
A. Dorsal median sulcus
B. Gracile nucleus
C. Fasciculus gracilis
D. Cuneate nucleus
E. Fasciculus cuneatus
F. Spinal nucleus of trigeminal nerve
G. Spinal tract of trigeminal nerve
H. Dorsal spinocerebellar tract
I. Ventral spinocerebellar tract
J. Pyramid
K. Pyramidal decussation
L. Ventral median fissure
M. Central canal
N. Central grey mater



Internal Structures of Brainstem

Section: **Mid Medulla**

Level of: **Sensory Decussation**



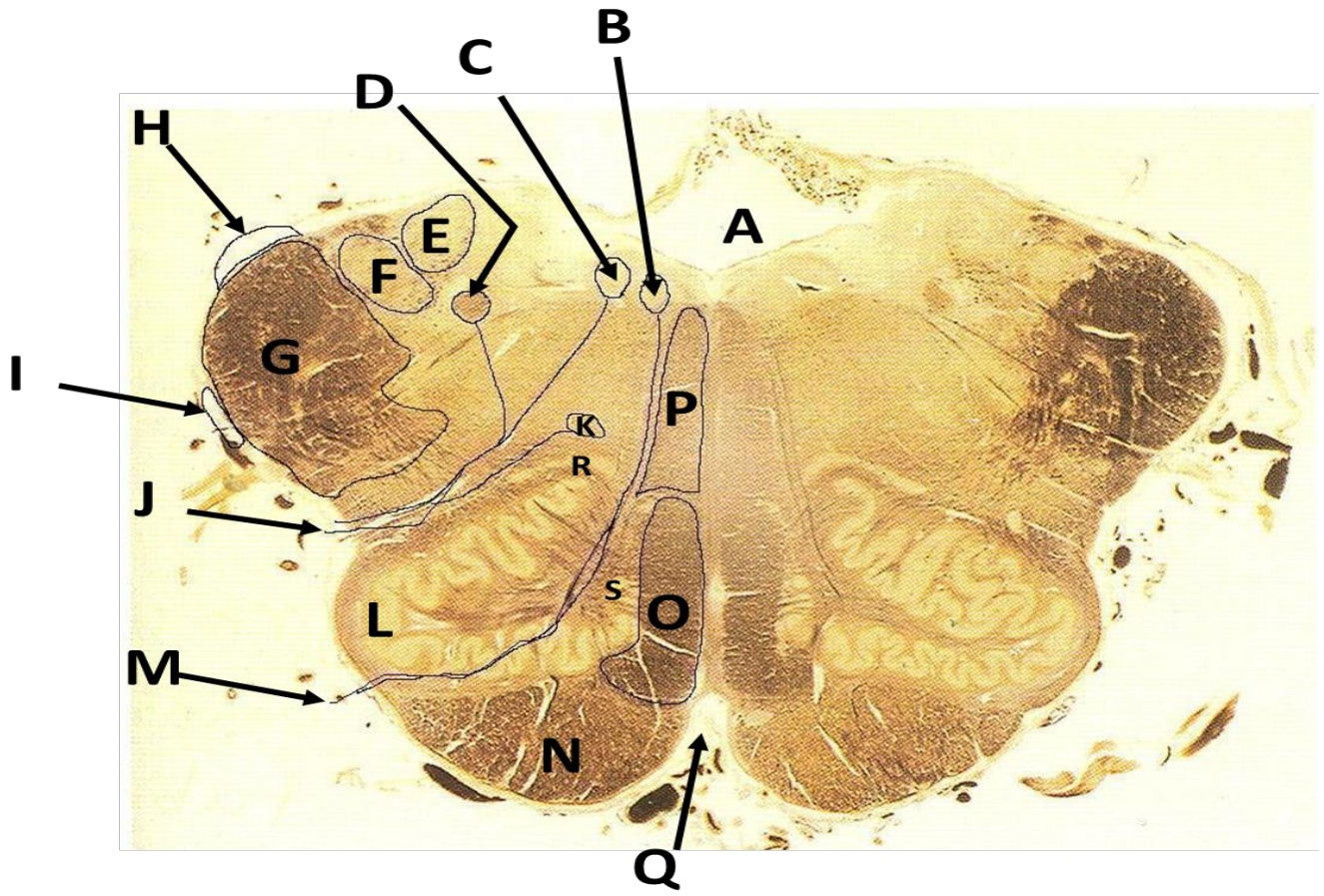
A. Dorsal median sulcus
B. Gracile nucleus
C. Fasciculus gracilis
D. Cuneate nucleus
E. Fasciculus cuneatus
F. Spinal nucleus of trigeminal nerve
G. Spinal tract of trigeminal nerve
H. Dorsal spinocerebellar tract
I. Ventral spinocerebellar tract
J. Pyramid
K. Medial lemniscus
L. Ventral median fissure
M. Sensory decussation (crossed internal arcuate fibers)
N. Internal arcuate fibers
O. Central canal
P. Central grey mater

لاحظو انه دائما النيوكليا تكون داخل والتراكت او الفاسيكيولس تبعها يكون برى

Internal Structures of Brainstem

Section: **Rostral Medulla**

Level of: **Inferior Olivary Nucleus** Important!

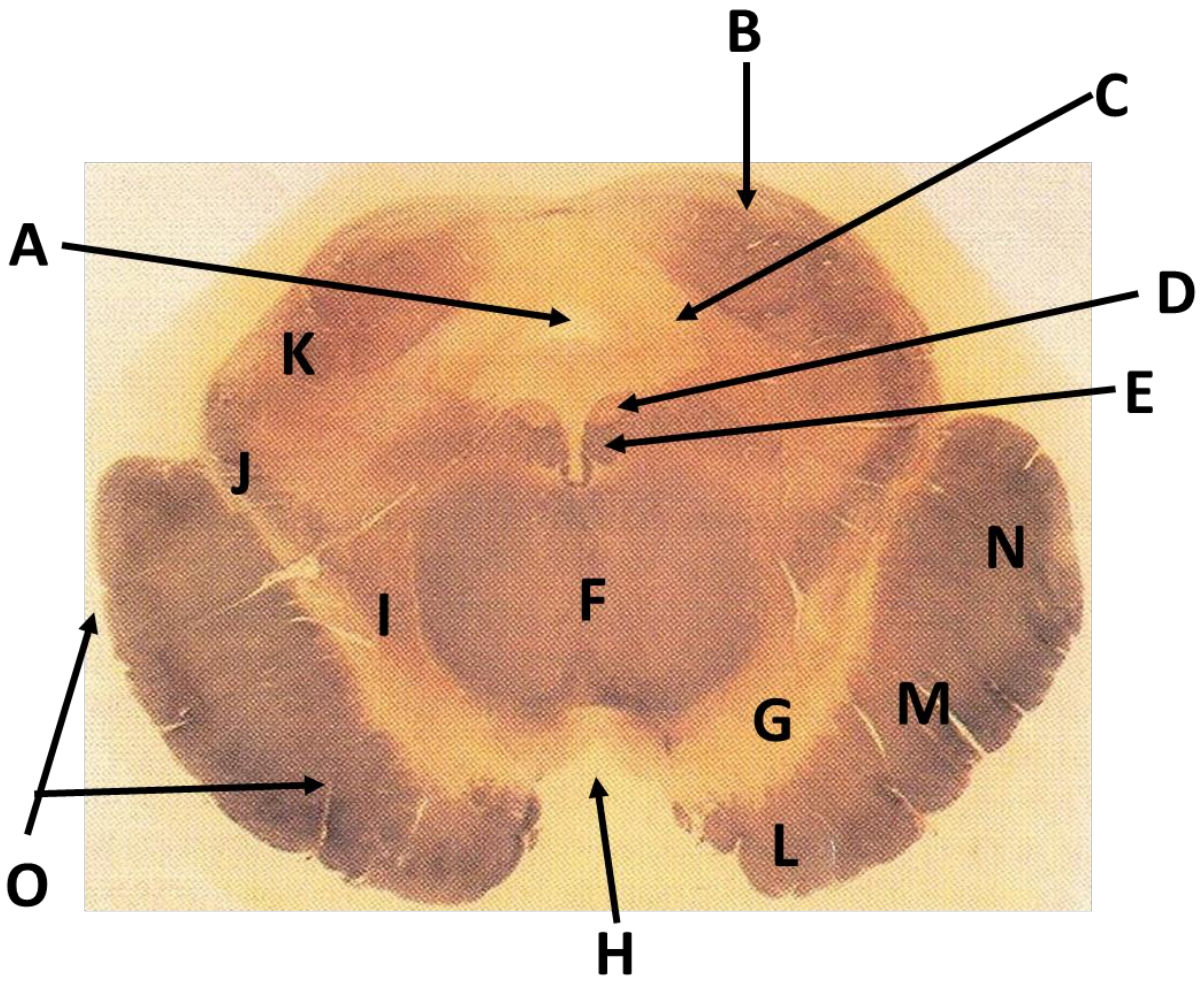


A. 4th ventricle
B. Hypoglossal nucleus
C. Dorsal vagal nucleus
D. Nucleus solitarius
E. Medial vestibular nucleus
F. Lateral vestibular nucleus
G. Inferior cerebellar peduncle
H. Dorsal cochlear nucleus
I. Ventral cochlear nucleus
J. Vagus nerve
K. Nucleus ambiguus
L. Inferior olivary nucleus
M. Hypoglossal nerve
N. Pyramid
O. Medial lemniscus
P. Medial longitudinal fasciculus
Q. Ventral median fissure
R. Dorsal accessory olive
S. Medial accessory olive

Internal Structures of Brainstem

Section: **Midbrain**

Level of: **Inferior Colliculus** Important!



A. Cerebral aqueduct
B. Inferior colliculus
C. Mesencephalic nucleus of trigeminal
D. Trochlear nucleus
E. Medial longitudinal fasciculus
F. Decussation of superior cerebellar peduncle
G. Substantia nigra
H. Interpeduncular fossa
I. Medial lemniscus
J. Spinal lemniscus
K. Lateral lemniscus
L. Frontopontine
M. Corticobulbar and Corticospinal
N. Temporo- parieto- occipito- pontine
O. Crus cerebri

Internal Structures of Brainstem

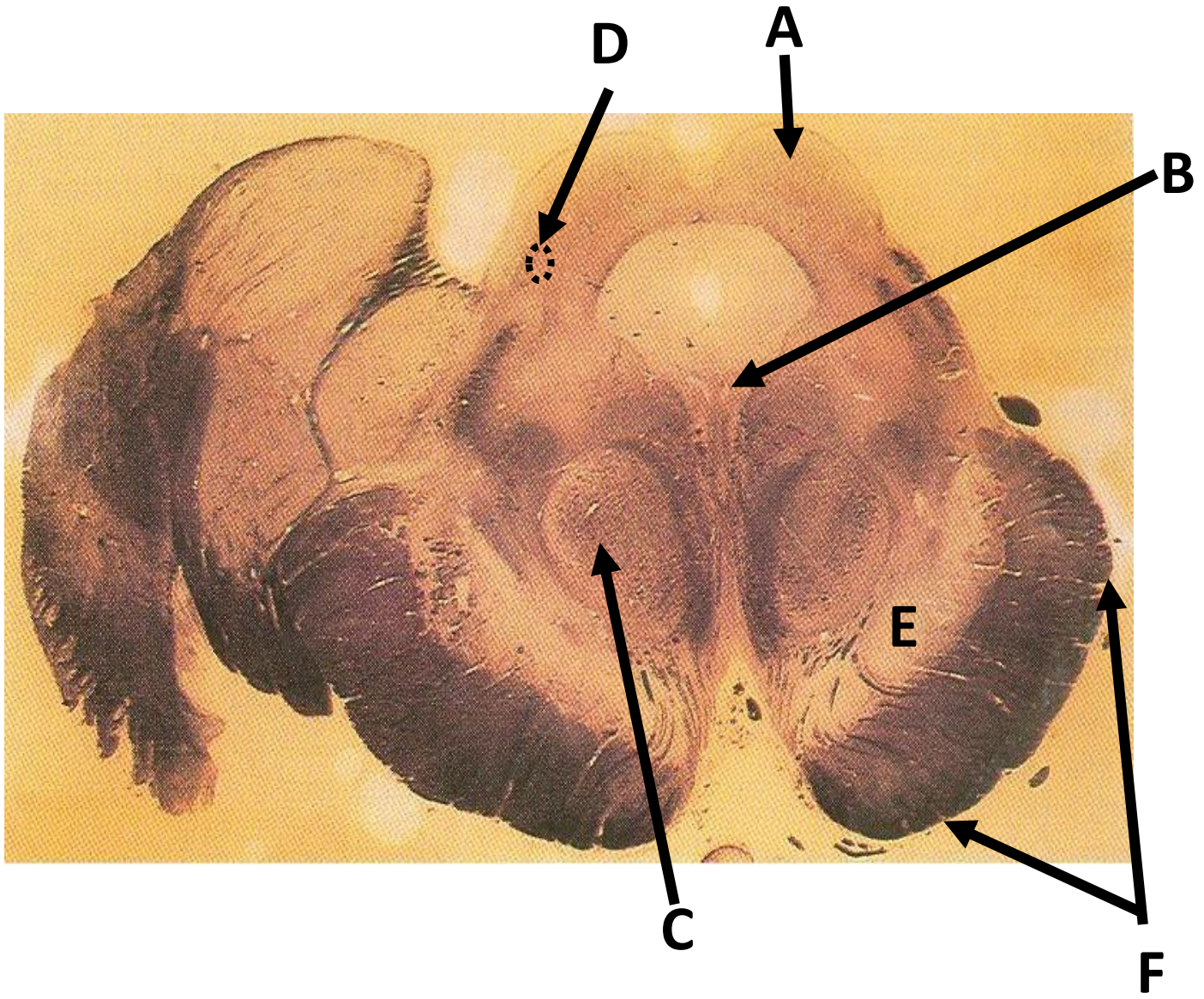
Section: **Midbrain**

Level of: **Superior Colliculus**

A. Superior colliculus
B. Oculomotor nucleus
C. Red nucleus
D. Pretectal nucleus
E. Substantia nigra
F. Crus cerebri

NO Lateral Lemniscus

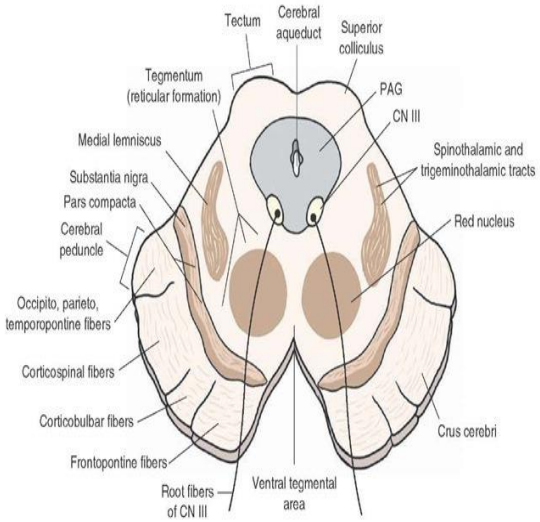
The red nucleus is only present in the level of superior colliculus and is important to know which level the section is from.

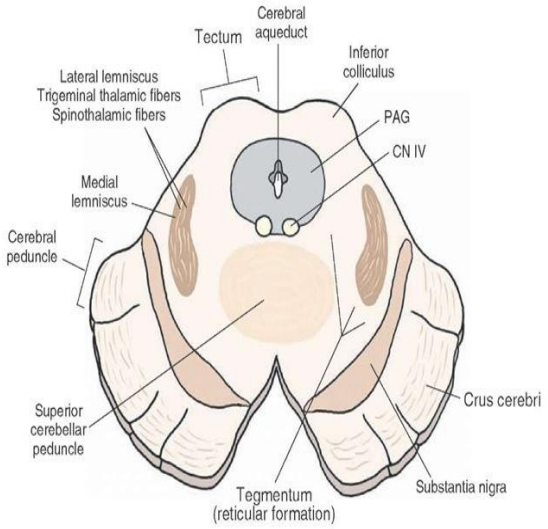


(EXTRA) How to differentiate between the sections?

MIDBRAIN

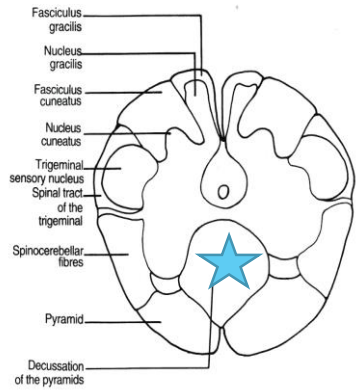
The midbrain is very clear because it has the **crus cerebri** and **substantia nigra**.
How do I know if it is inferior or superior colliculi level?
RED NUCLEUS!
Red nucleus is only in the **superior** colliculus level.
In the **inferior** colliculus you will have **decussation of superior cerebellar peduncle**

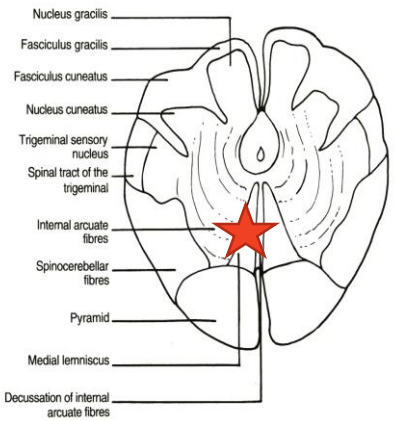


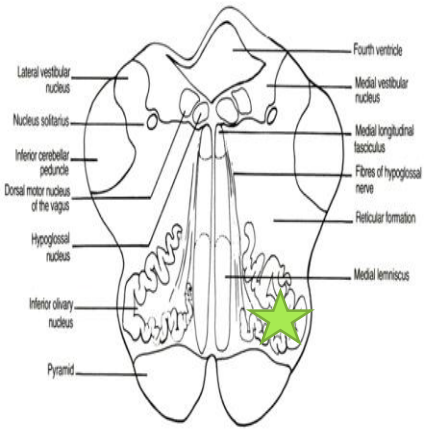


MEDULLA

Look for the **pyramids** to confirm the section is from the medulla.
Then to know which level, the most characteristic thing is **inferior olivary nucleus** which is found in the open (rostral) medulla.
Then if you see **medial lemniscus** it is the level of **sensory** decussation,
and if you see a mass in the middle an no medial lemniscus then it is the closed medulla at the level of **pyramidal decussation**

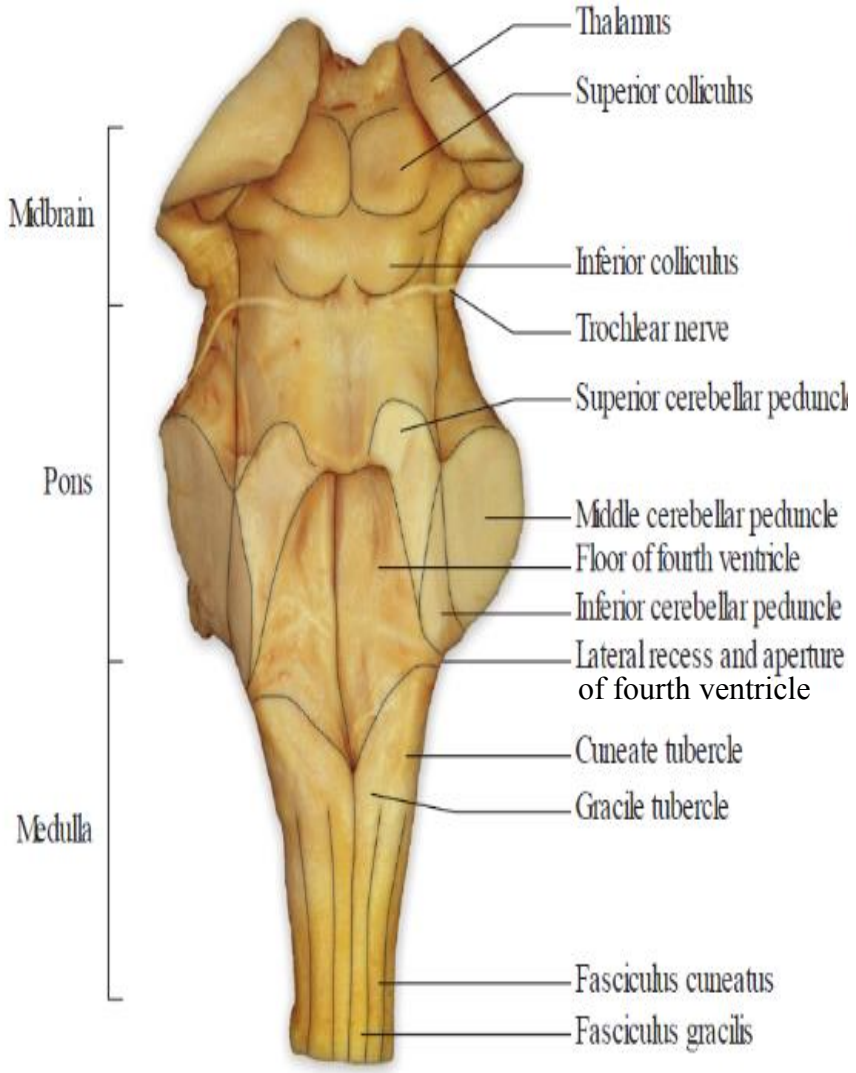


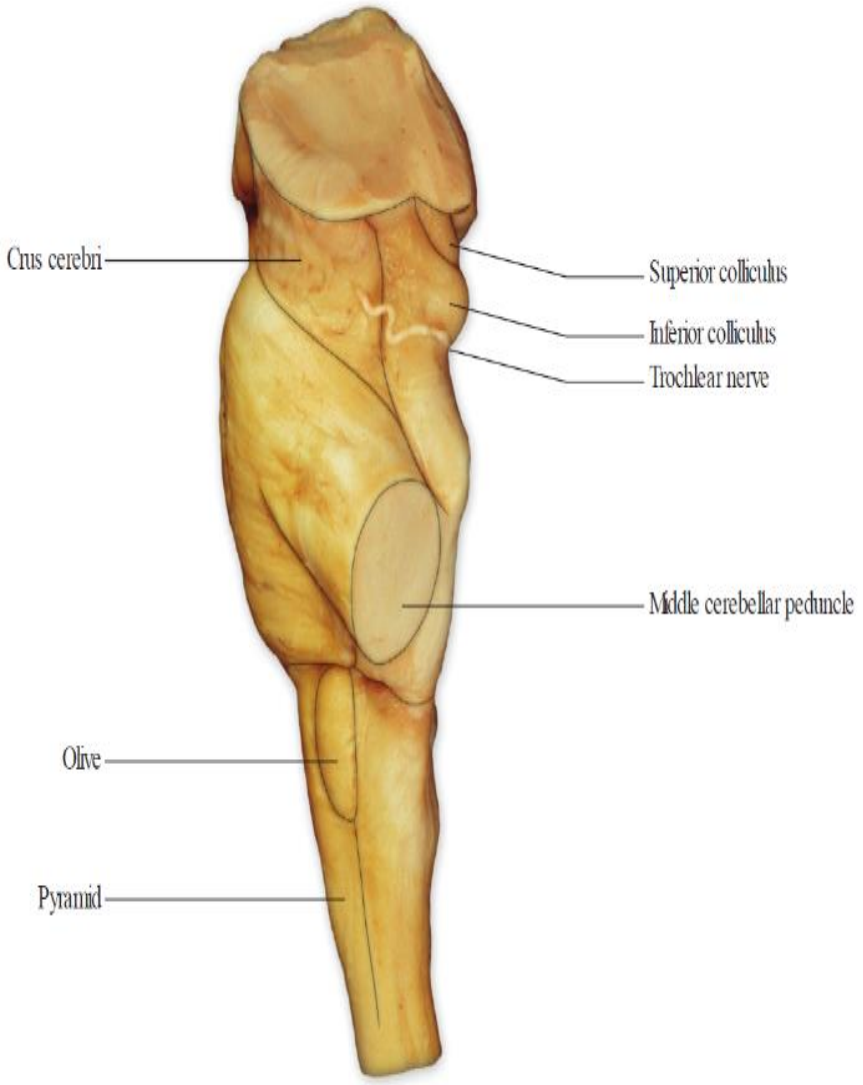


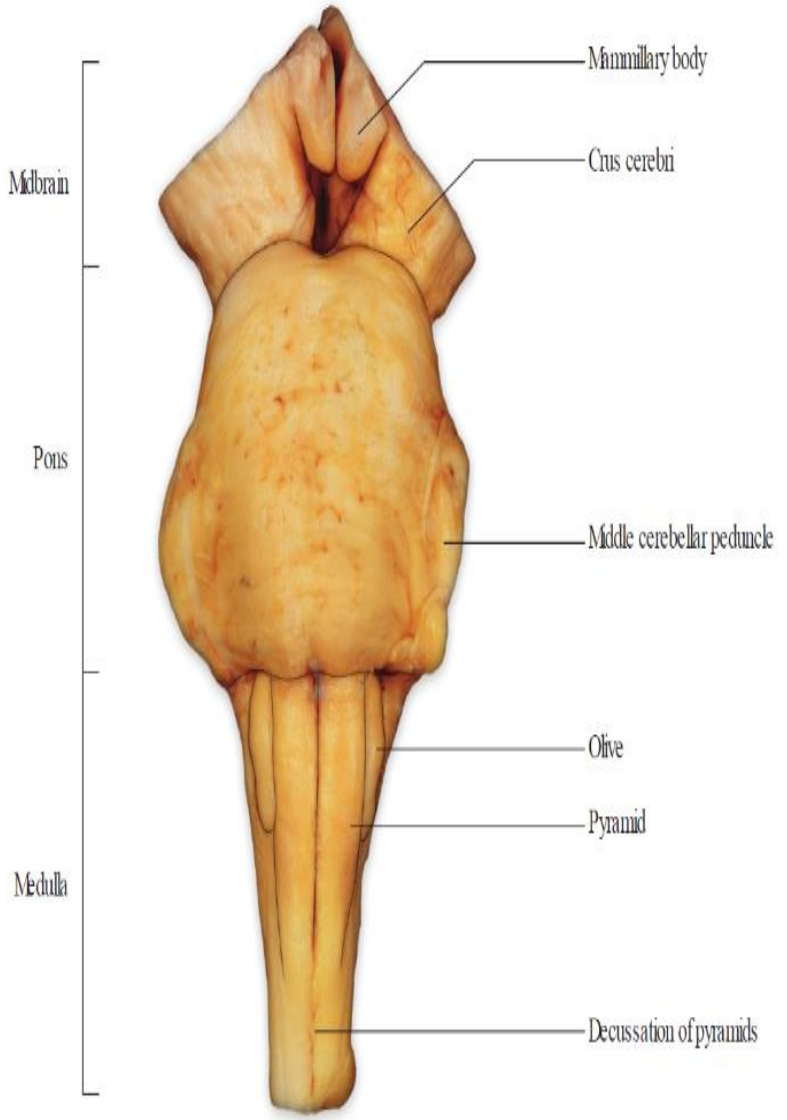


External Structures of Brainstem

(this slide is extra recommended by the doctor)



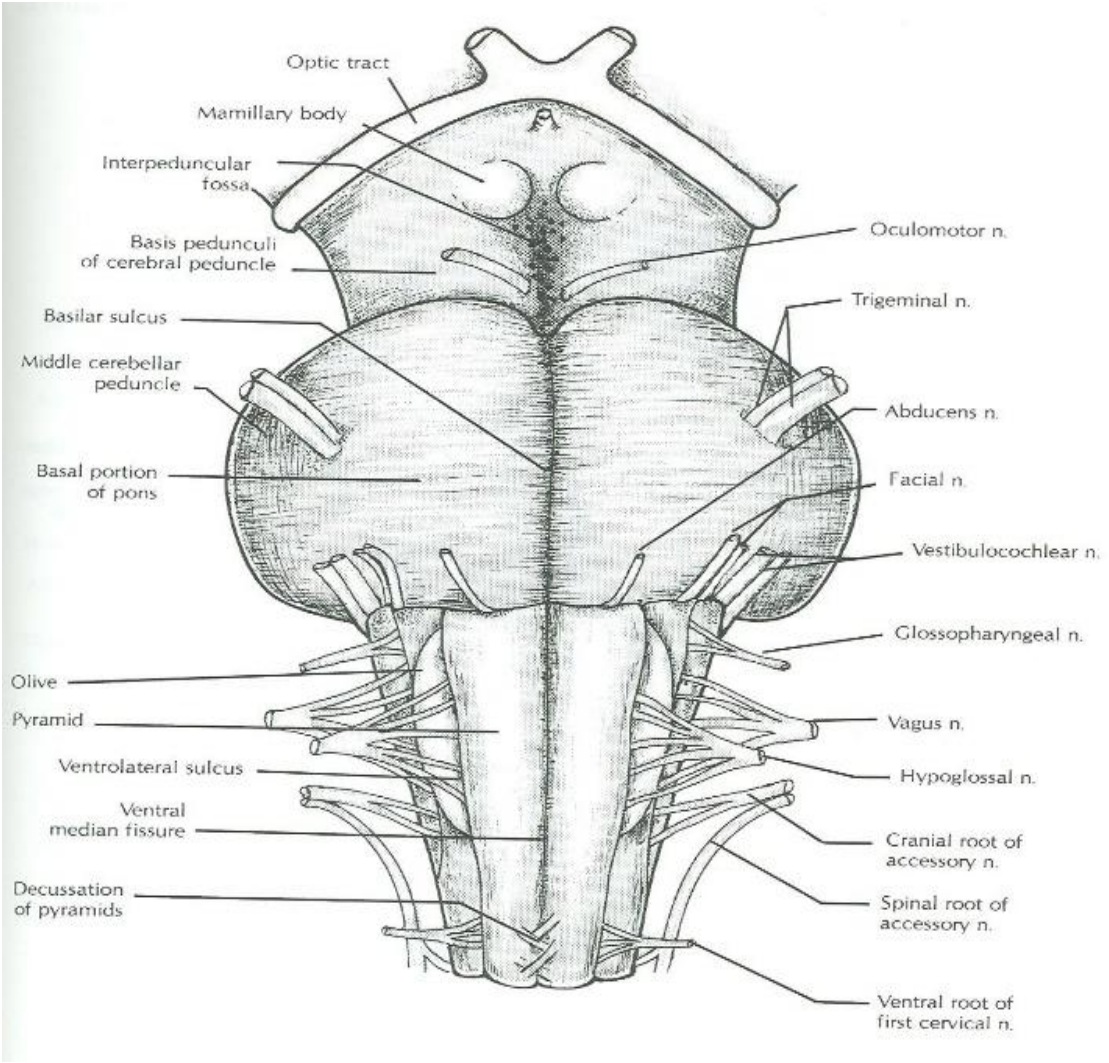




Cranial Nerves

You should Know:

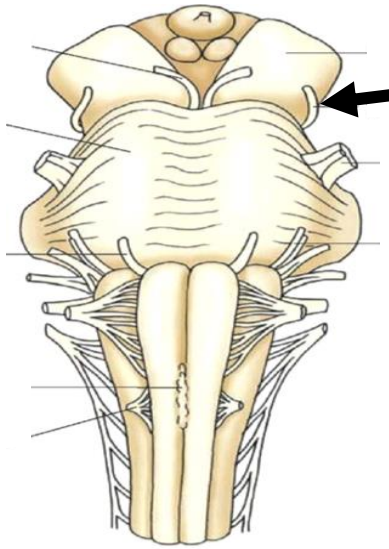
- Name of cranial nerves
- Motor & sensory supply
- Effect of injury

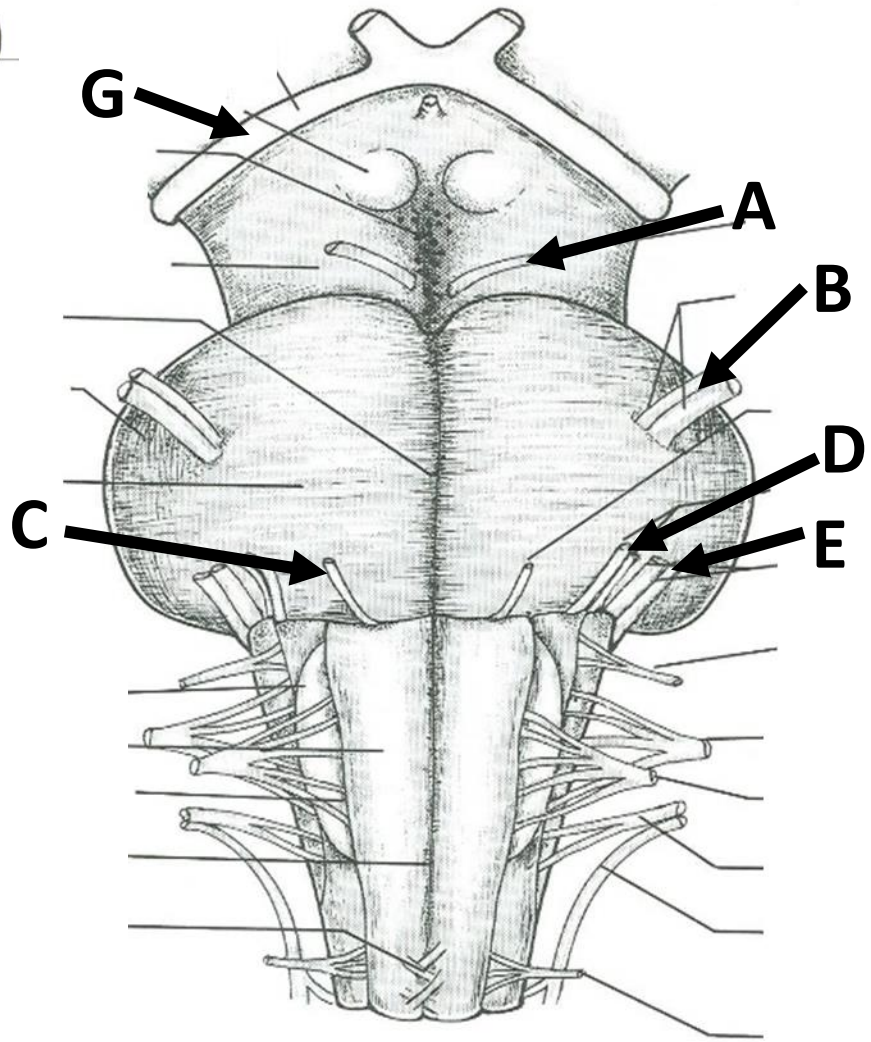


Cranial Nerve	Component fibers	Structures innervated	Injury
Olfactory (I)	Sensory	Olfactory epithelium	Anosmia
Optic (II)	Sensory	Retina	Anopsia Optic nerve → monocular blindness Optic chiasm → bitemporal hemianopia Optic tract, optic radiation, occipital cortex → contralateral homonymous hemianopia Both visual cortices → complate blindness

Cranial Nerves

A. Oculomotor nerve
B. Trigeminal nerve
C. Abducens nerve
D. Facial nerve
E. Vestibulocochlear nerve
F. Trochlear nerve
G. Optic tract



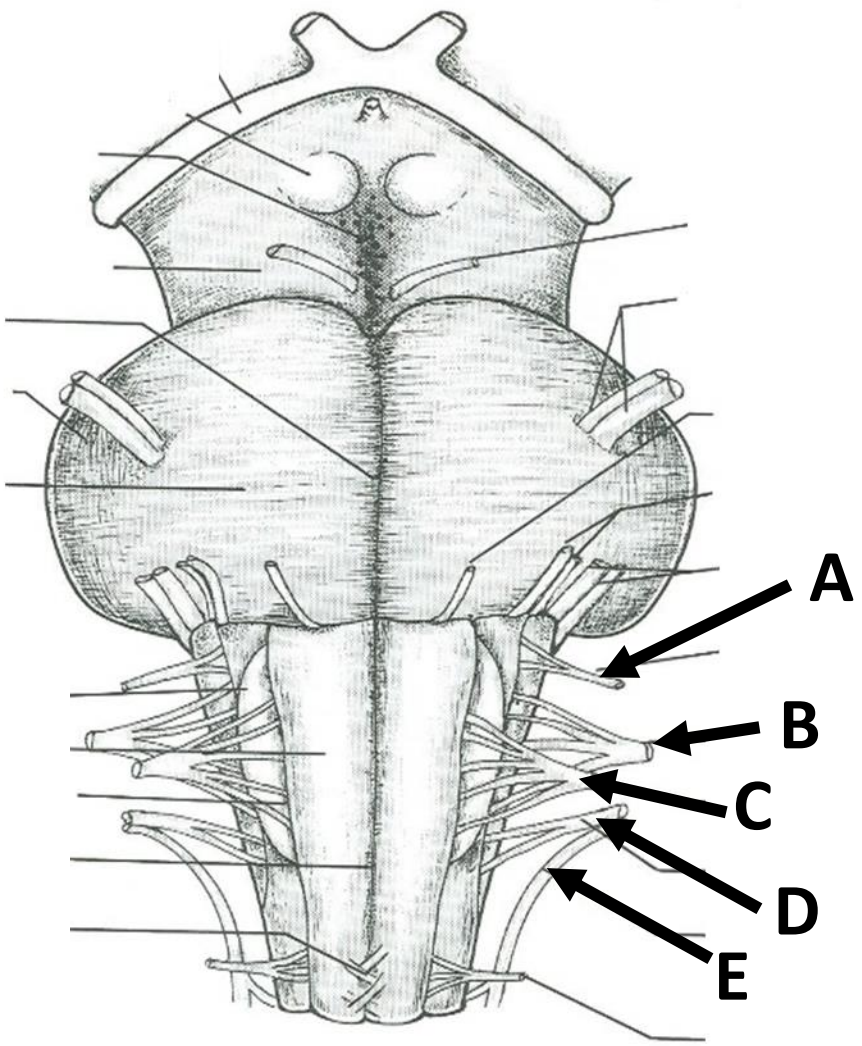


Cranial Nerve	Component fibers	Structures innervated	Injury
Oculomotor (III)	Motor	Superior, inferior, and medial rectus muscles, inferior oblique muscle, levator palpebrae superioris muscle	Lateral squint, ptosis, diplopia, impaired upward and inward movement of the eyeball on the damaged side
	Parasympathetic	Sphincter pupillae and ciliary muscle of the eyeball	
Trochlear (IV)	Motor	Superior oblique muscle	Diplopia, inability to rotate the eye inferolaterally
Trigeminal (V)	Sensory	Face, scalp, cornea, nasal and oral cavities, cranial dura mater	Trigeminal neuralgia or tic douloureux
	Motor	Muscles of mastication, tensor tympani	
Abducens (VI)	Motor	Lateral rectus muscle	Medial squint, inability to direct the affected eye laterally
Facial (VII)	Sensory	Anterior two-thirds of tongue	Bell's palsy
	Motor	Muscles of facial expression, stapedius muscle	
	Parasympathetic	Salivary and lacrimal glands	
Vestibulocochlear (VIII)	Sensory	Vestibular apparatus, cochlea	Deafness, tinnitus, vertigo, dizziness, nausea, nystagmus.

Cranial Nerves

A. Glossopharyngeal nerve
B. Vagus nerve
C. Hypoglossal nerve
D. Cranial root of accessory nerve
E. Spinal root of accessory nerve (arises from C1-C5)

Cranial Nerve	Component fibers	Structures innervated	Injury
Glossopharyngeal (IX)	Sensory	Pharynx, posterior third of tongue, eustachian tube, middle ear, carotid body, carotid sinus	Dysphonia, dysphagia, absence of gag reflex
	Motor	Stylopharyngeus muscle	
	Parasympathetic	Parotid salivary gland	
Vagus (X)	Sensory	Pharynx, larynx, trachea, oesophagus, external ear, thoracic and abdominal viscera, aortic arch	Hoarsness or loss of voice, impaired swallowing, GI dysfunction, blood pressure anomalies
	Motor	Soft palate, pharynx, larynx, upper eosophagus	
	Parasympathetic	Thoracic and abdominal viscera	
Accessory (XI)	Motor	Sternomastiod and trapezius muscle, soft palate, larynx, pharynx	Difficulty swallowing and speech, inability to turn head, inability to shrug or raise shoulder
Hypoglossal (XII)	Motor	Intrinsic and extrinsic muscles of the tongue	Loss of tongue movement, difficulty in chewing and speech, tongue paralysis



Cerebrum

SUPEROLATERAL SURFACE

You should Know:

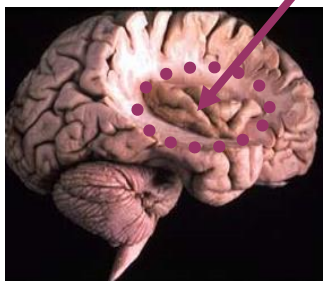
- Name of gyri and sulci,
- Important functional areas,
- Arterial supply

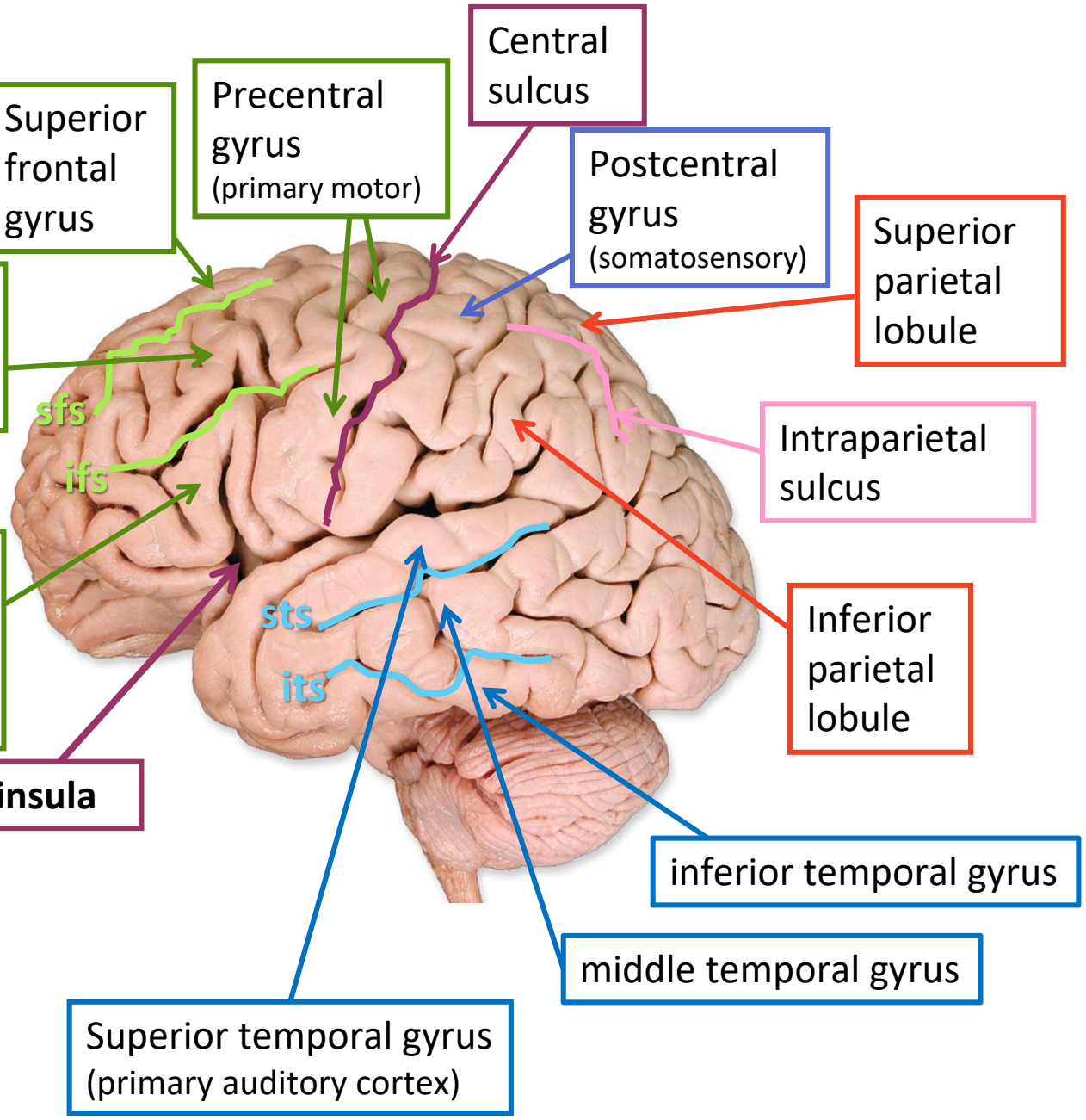
SFS: superior frontal sulcus

IFS: inferior frontal sulcus

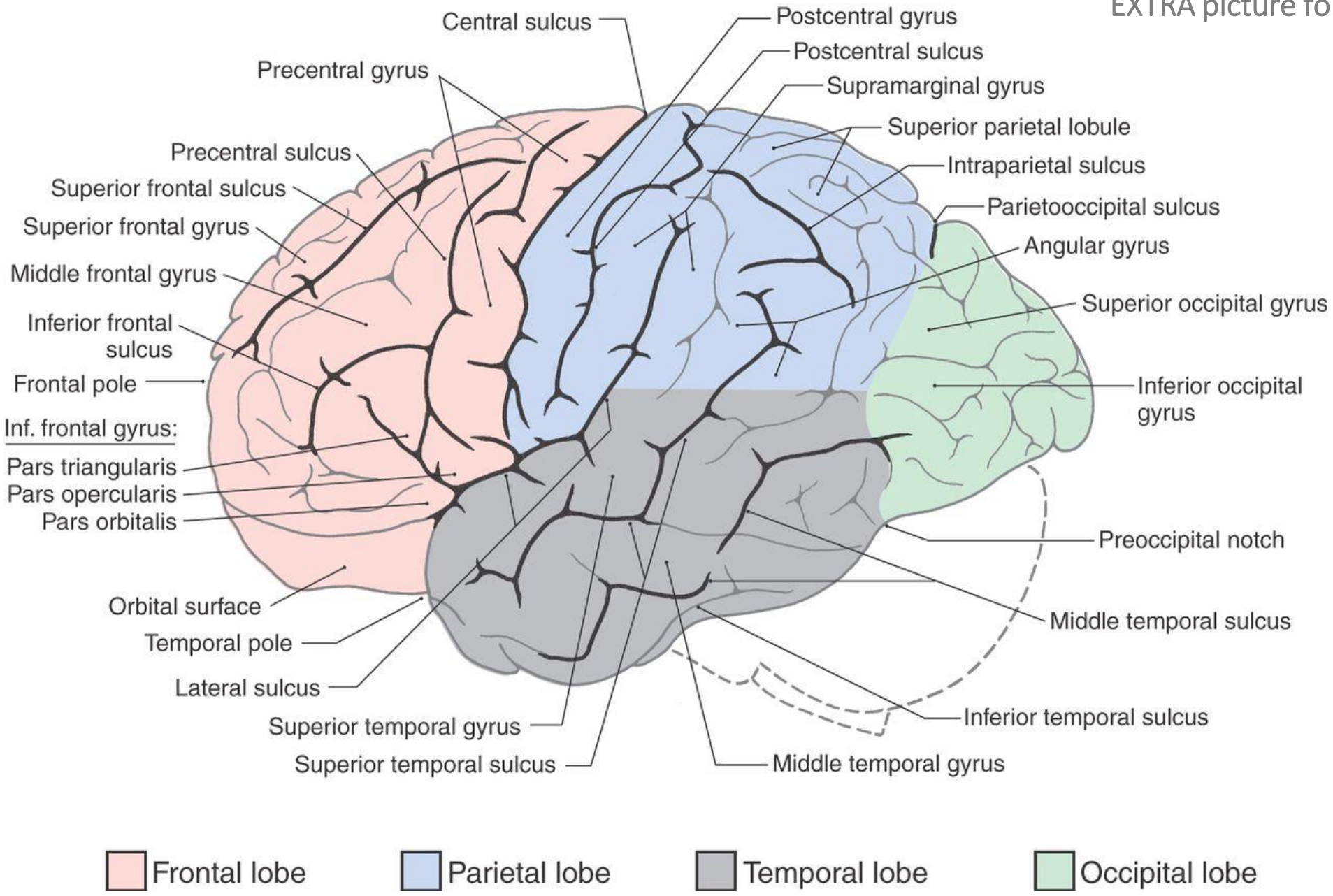
STS: superior temporal sulcus

ITS: inferior temporal sulucs





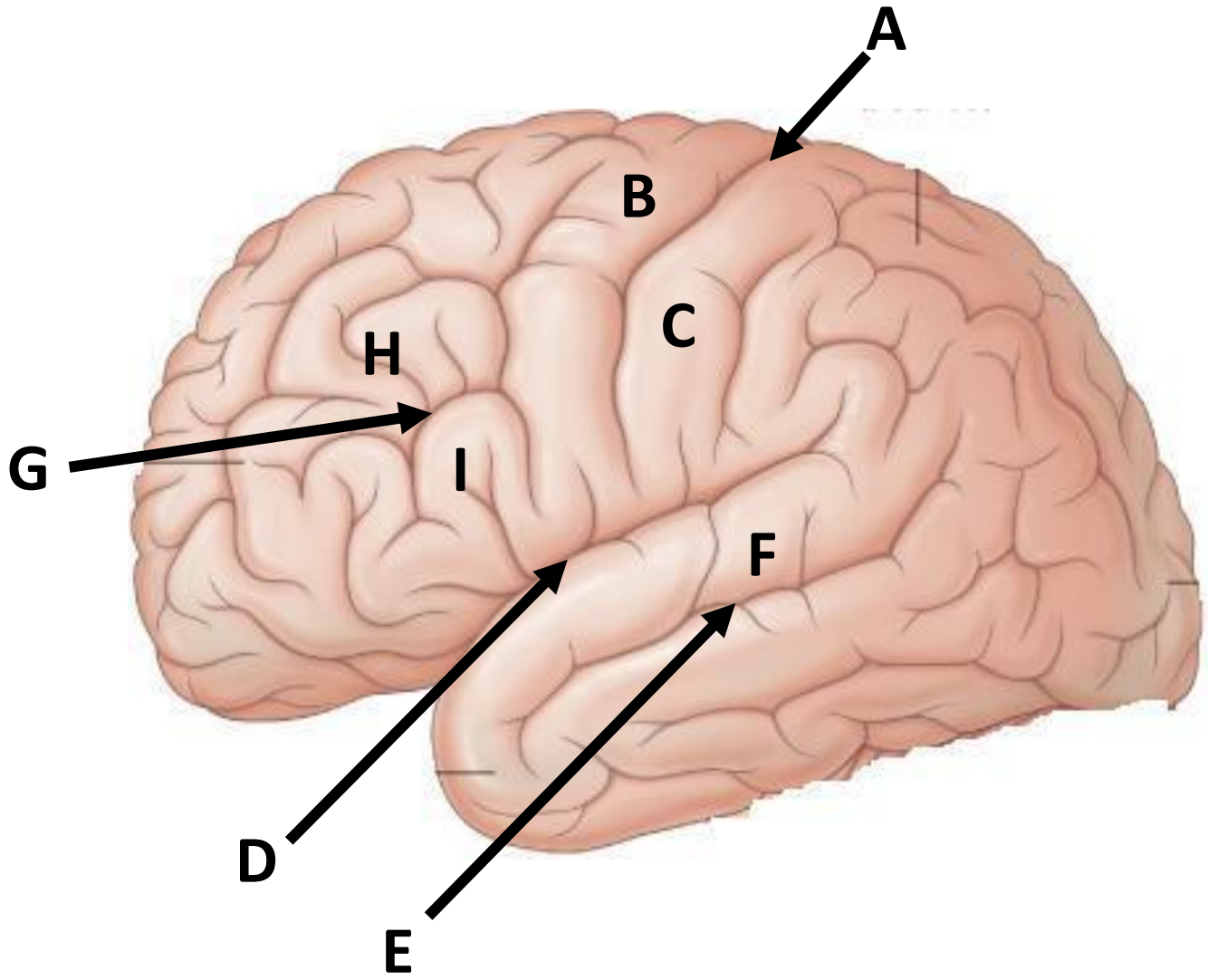
EXTRA picture for understanding



Cerebrum

SUPEROLATERAL SURFACE

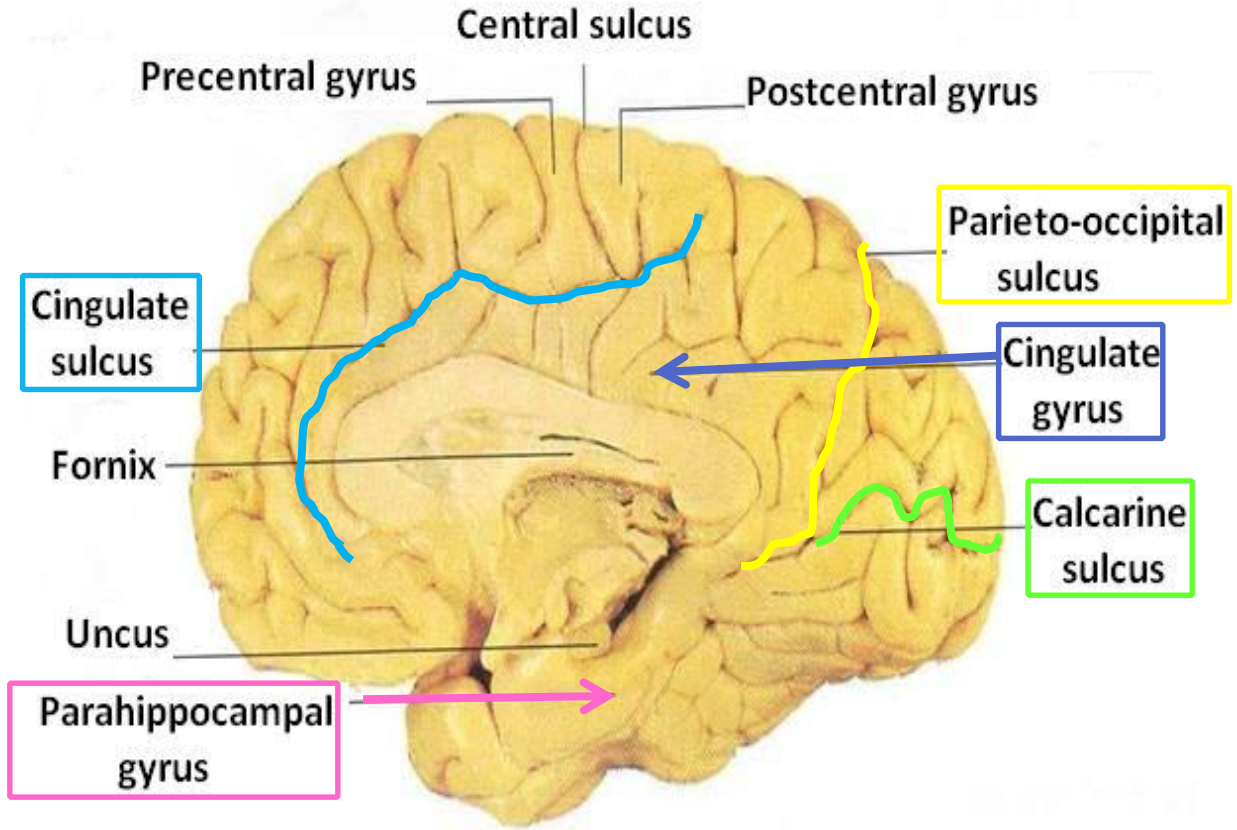
A. Central sulcus
B. Precentral gyrus
C. Postecentral gyrus
D. Lateral (sylvian) sulcus
E. Superior temporal sulcus
F. Superior temporal gyrus
G. Inferior frontal sulcus
H. Middle frontal gyrus
I. Inferior frontal gyrus

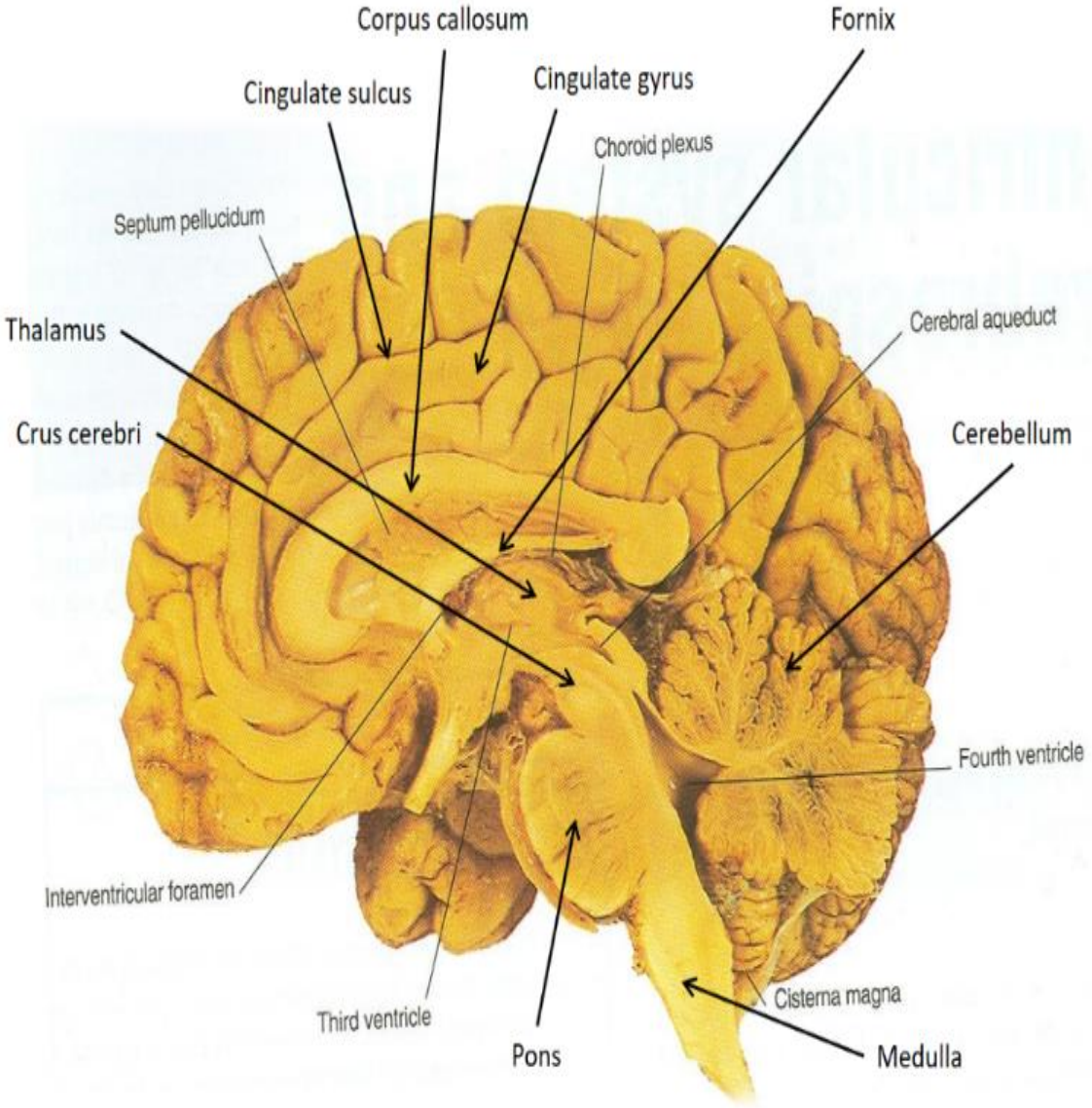


Cerebrum

MEDIAL SURFACE

Important!





Cerebrum

MEDIAL SURFACE

A. Thalamus

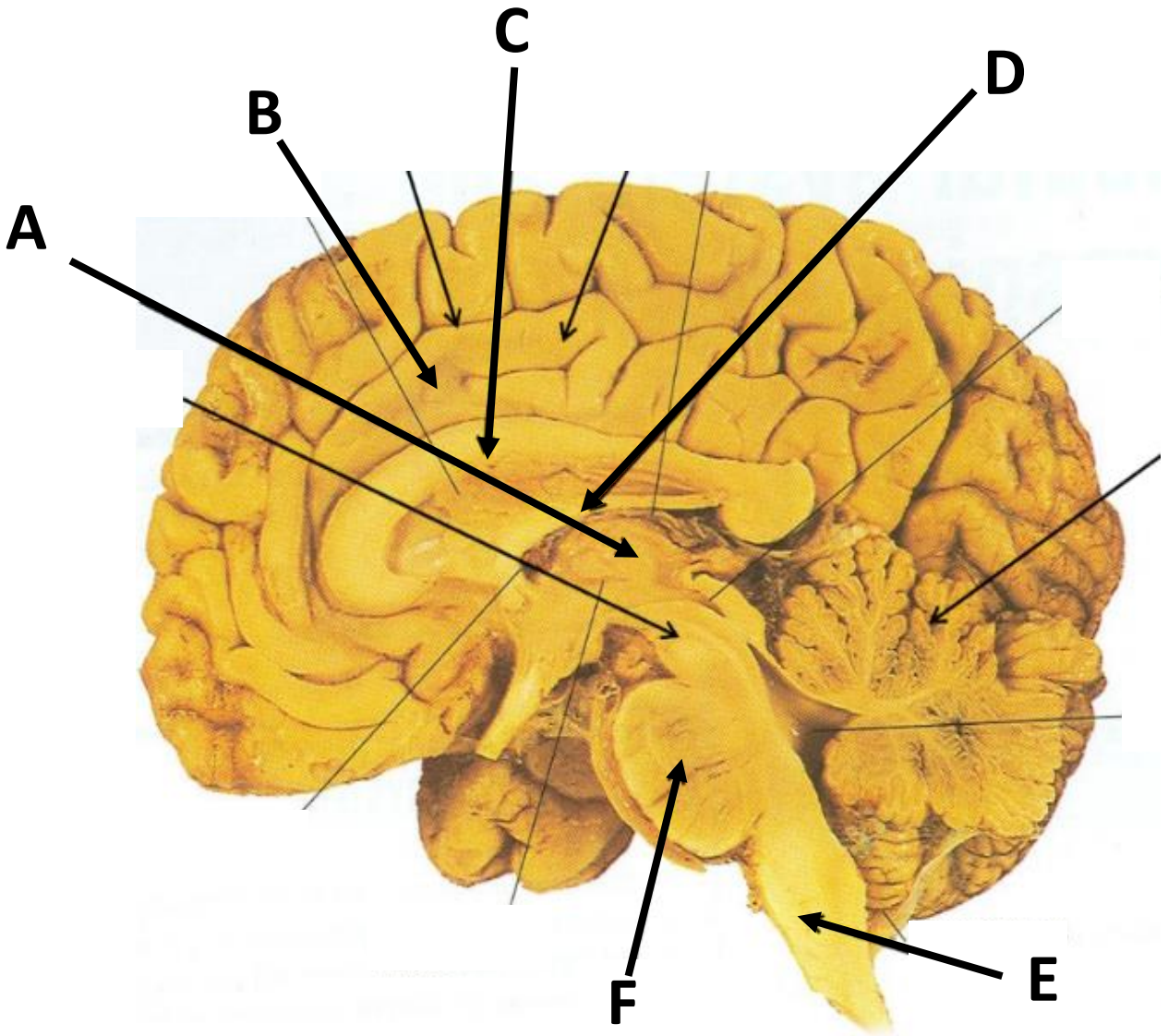
B. Cingulate gyrus

C. Corpus callosum

D. Fornix

E. Medulla

F. Pons

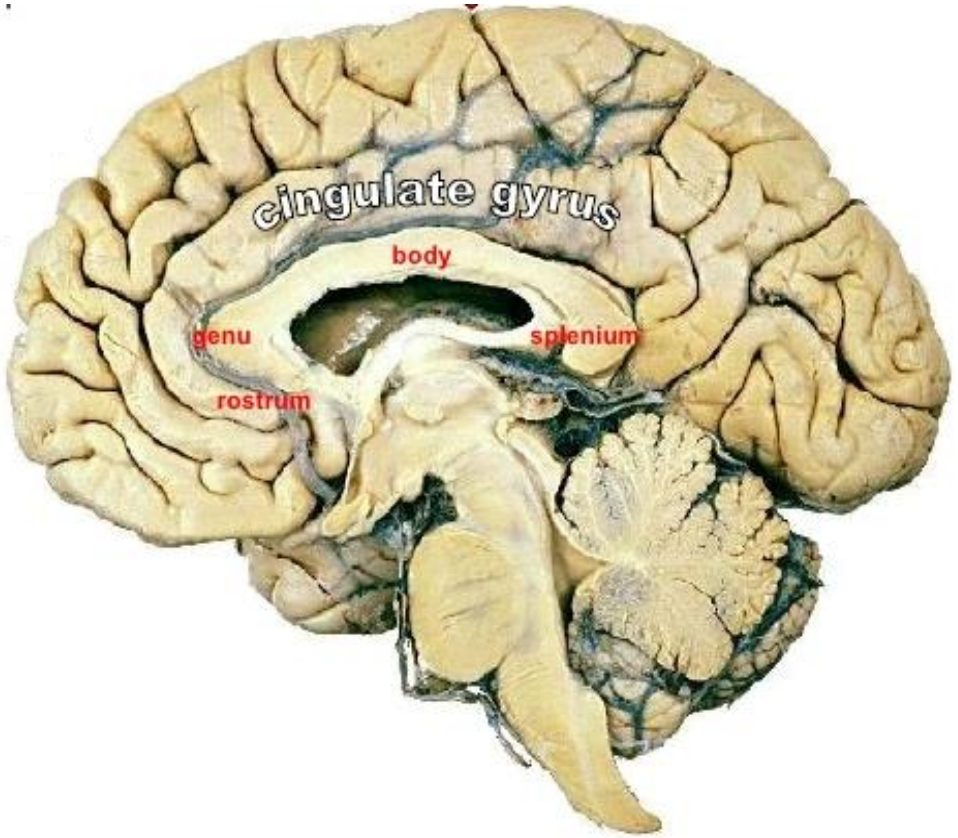


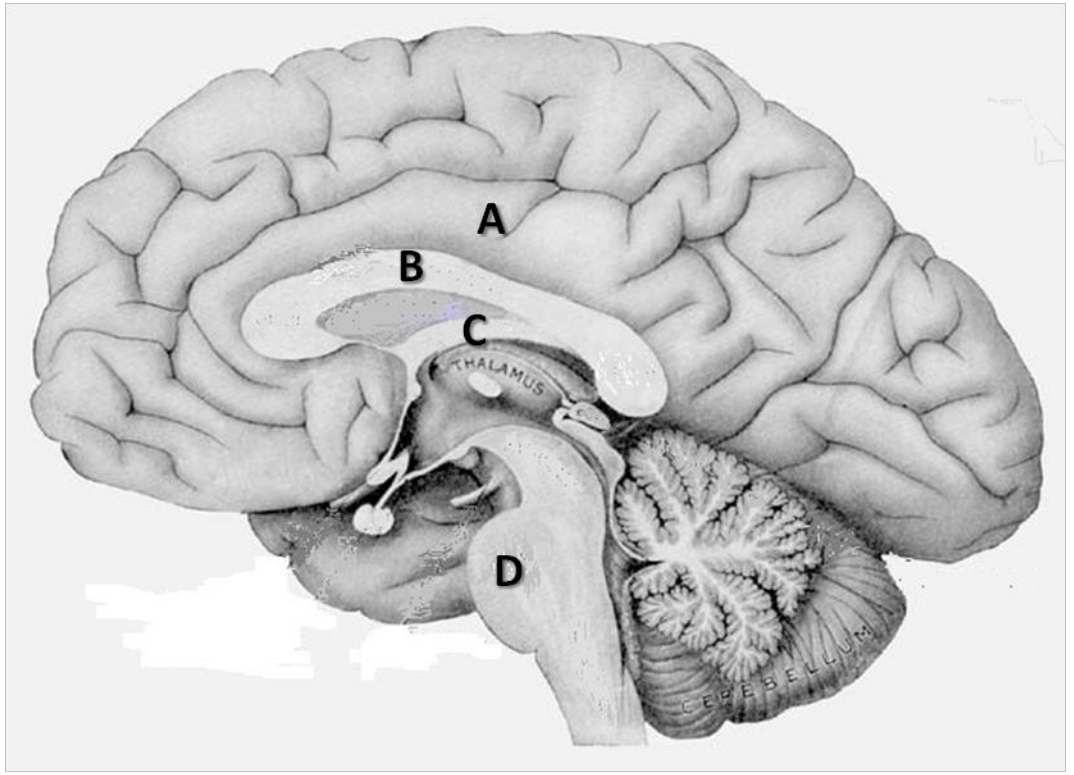
Cerebrum

(this slide is extra recommended by the doctor)

Important!

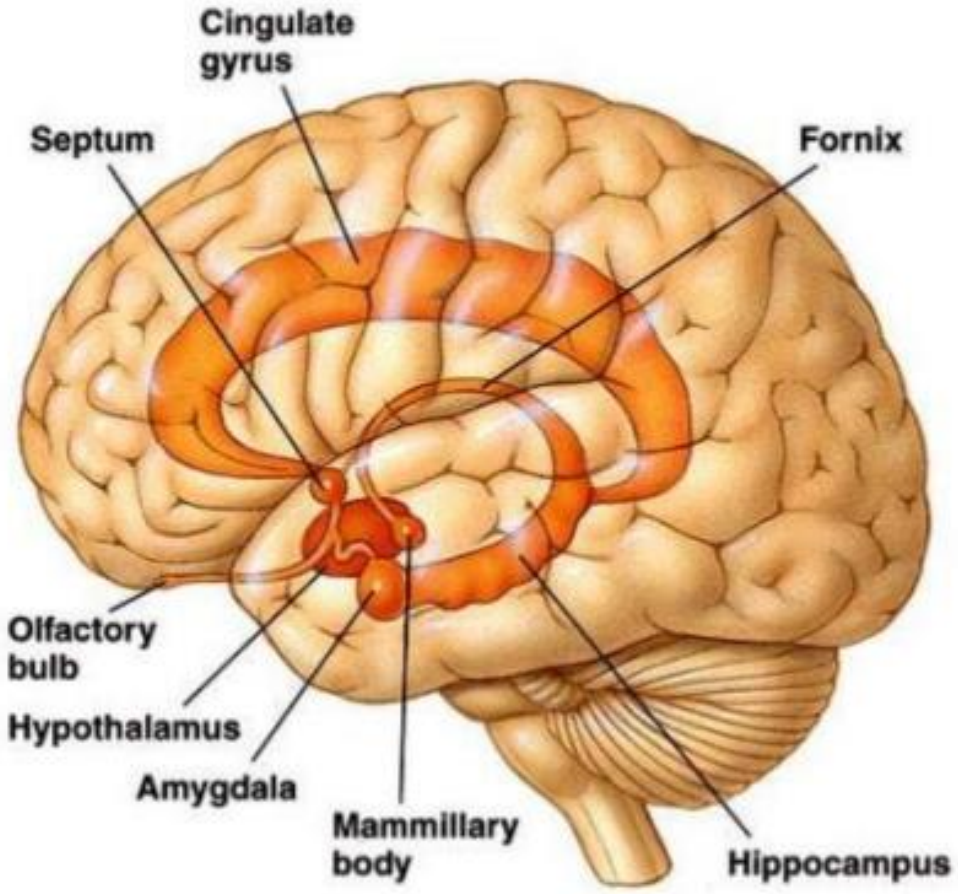
CORPUS CALLOSUM

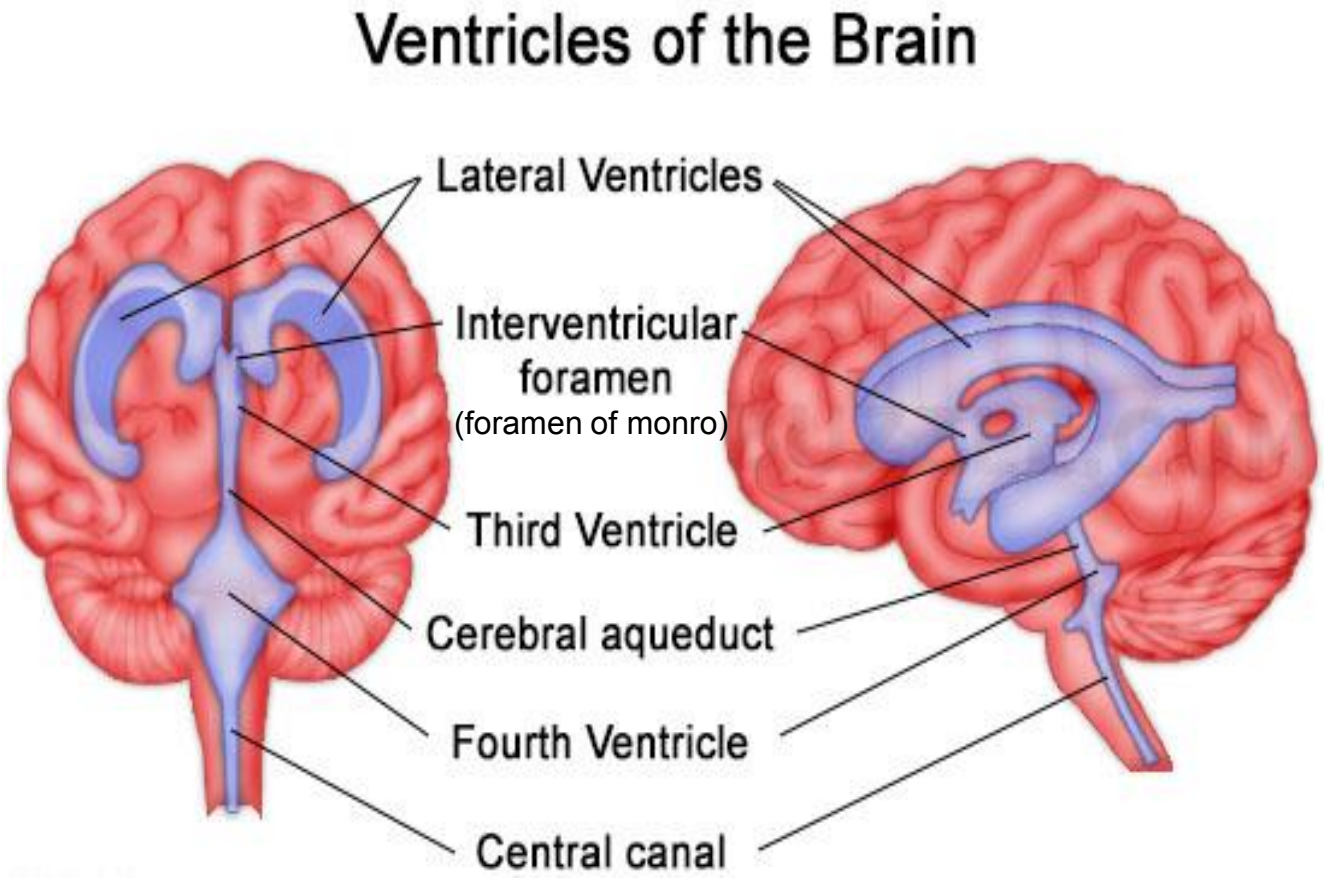




A. Cingulate gyrus.
B. Corpus callosum (commissural fibers).
C. Fornix.
D. Pons.

(this slide is extra recommended by the doctor)





Cerebrum

FUNCTIONAL AREAS

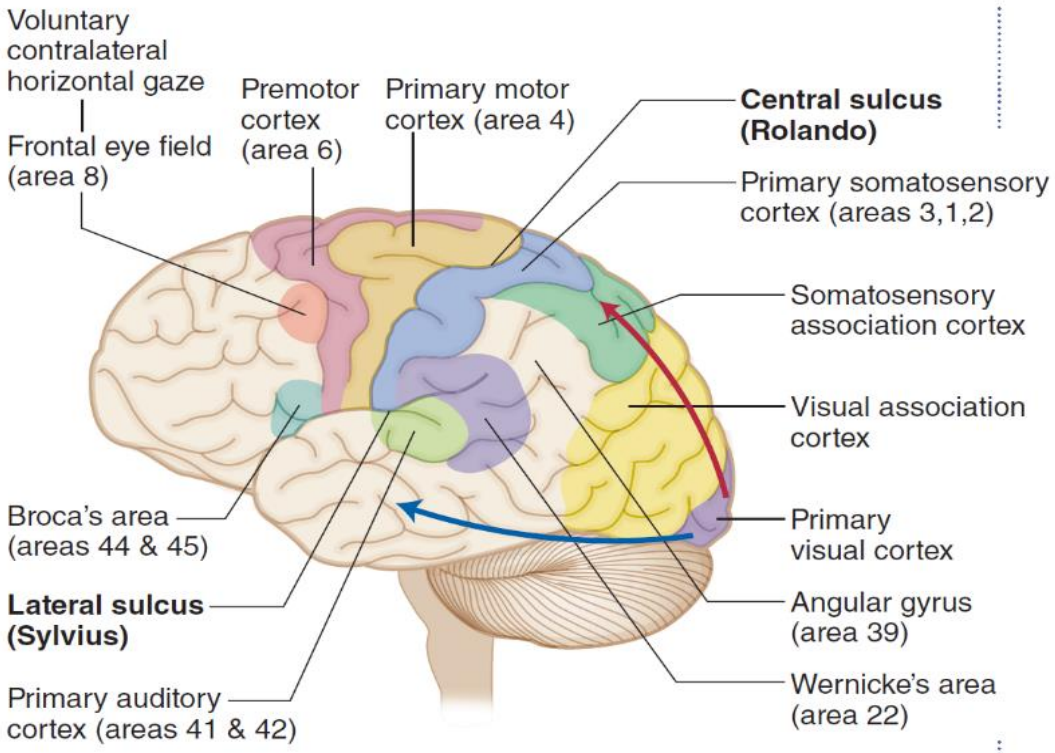
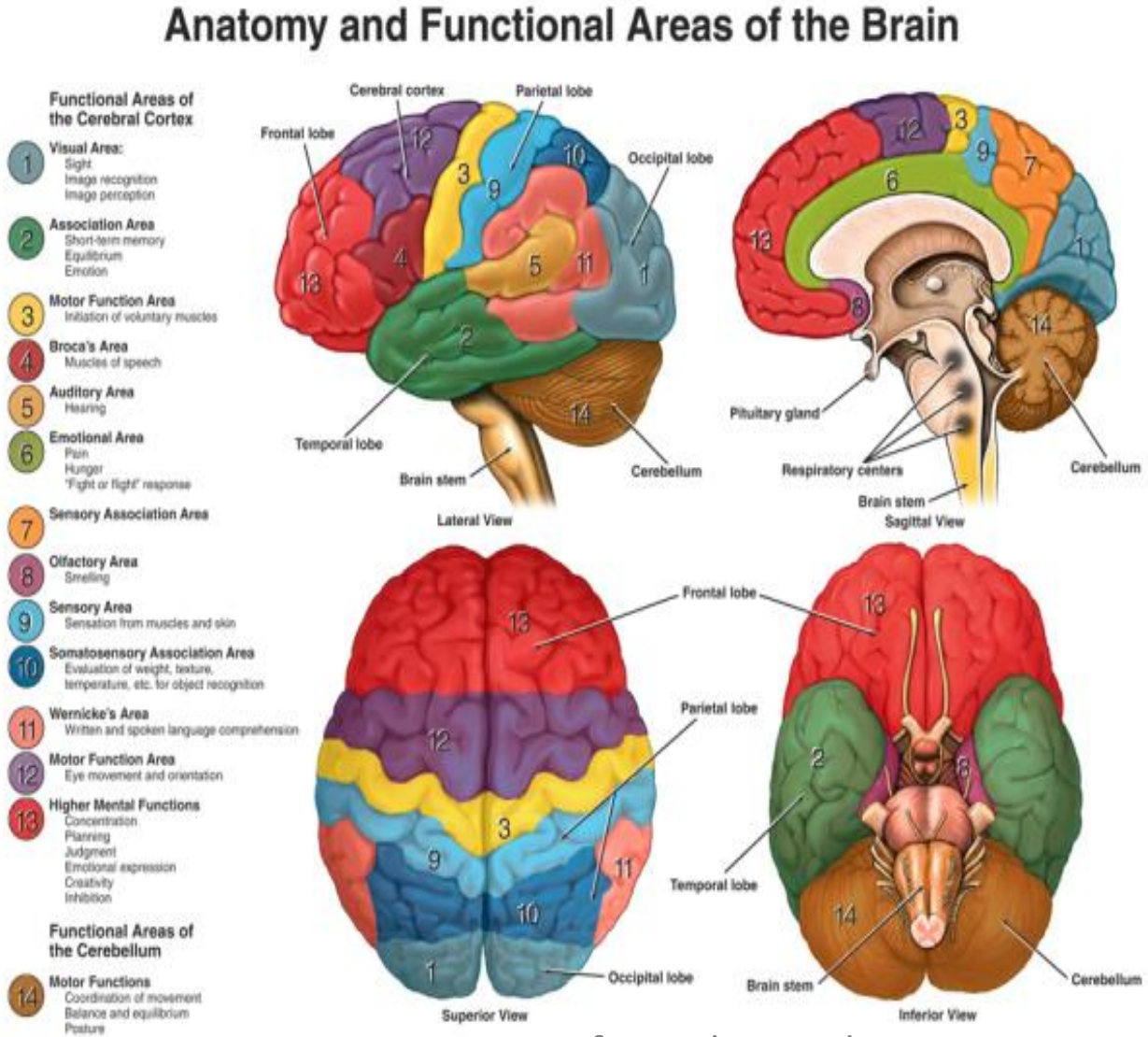


Figure III-10-11. Cerebral Cortex: Functional Areas of Left (Dominant) Hemisphere



EXTRA picture for understanding

(this slide is extra to summarize)

Frontal Lobe	
Primary motor cortex	Located in *precentral gyrus*
Premotor cortex	Located *anterior to the precentral gyrus*
Prefrontal cortex	Extensive region *anterior to premotor area*.
Broca's (motor speech) area	Located in the *inferior frontal gyrus.*
Frontal eye field	Located in the *middle frontal gyrus.*

Parietal lobe	
Primary somatosensory cortex	located in *postcentral gyrus*
Parietal association cortex	located *posterior to primary somatosensory* cortex.

Temporal Lobe	
Primary auditory cortex	located in *superior temporal gyrus*
Auditory association cortex	located posterior to the primary auditory cortex (also includes **Wernick's area**)

Occipital lobe	
Primary visual cortex	located on the *medial surface of the hemisphere*, in the gyri surrounding the calcarine sulcus
Visual association cortex	located *around the primary visual* cortex

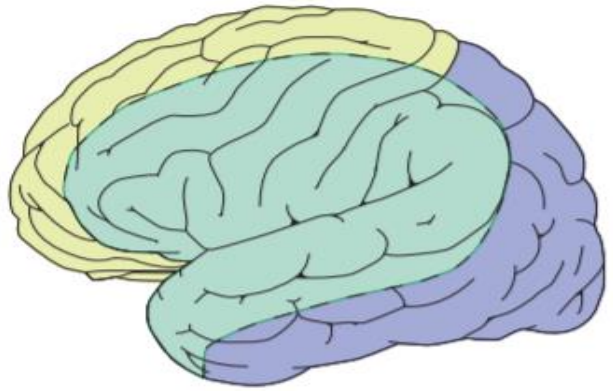
Cerebrum Important!

ARTERIAL SUPPLY

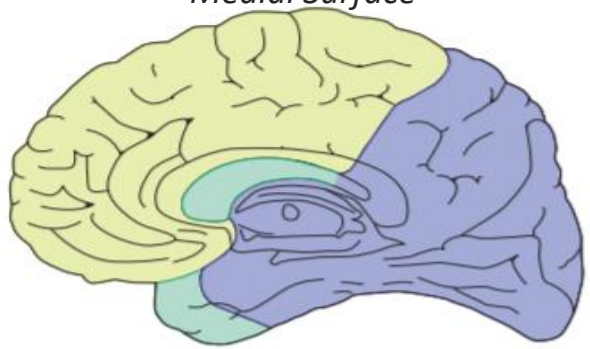
They could bring a case and tell you the patient has a lesion in one of the arteries what are his likely symptoms, or they could give you the symptoms and ask which artery is affected.

		supply	*blockage*
Internal Carotid	**Anterior** cerebral artery	1. Orbital and medial surfaces of **frontal** and **parietal** lobes. 2. A narrow part on the superolateral surface.	**1. Motor and sensory disturbance** in contralateral distal leg 2. Difficulty in **prefrontal lobe** functions: • Cognitive thinking • Judgement • Motor initiation • Self monitoring
	Middle cerebral artery	Entire Superolateral surface: 1. Somatosensory Cortex 2. Motor Cortex 3. Language areas: (**Broca's Area**: and **Wernicke's Area**) 4. Primary auditory area + **Heschl's Gyrus**	1. Contralateral **weakness** and **sensory loss** of face, arm, and hands more than legs 3. Visual field cut (damage to **optic radiation**) **4. Aphasia** (language disturbance).
Vertebro-Basilar	**Posterior** cerebral artery	1. Anterior and inferior **temporal** lobes **2. Uncus**: related to sense of **smell**. 3. Inferior temporal gyri 4. Inferior and Medial **Occipital lobe** (visual area)	**1. Visual** disturbances (contralateral homonymous hemianopsia or cortical blindness/Anton's Syndrome (bilateral lesion) **2. Memory** impairment (temporal lobe)

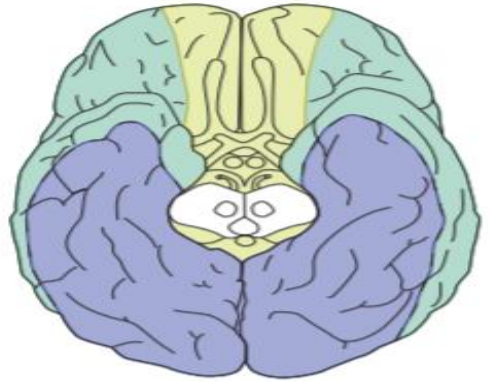
Superolateral Surface



Medial Surface



Inferior Surface



Cerebrum

TRANSVERSE CUT

1- Corpus Callosum

2- Claustrum

3- Lateral Ventricle

4- Caudate nucleus

5- Thalamus

6- Third ventricle

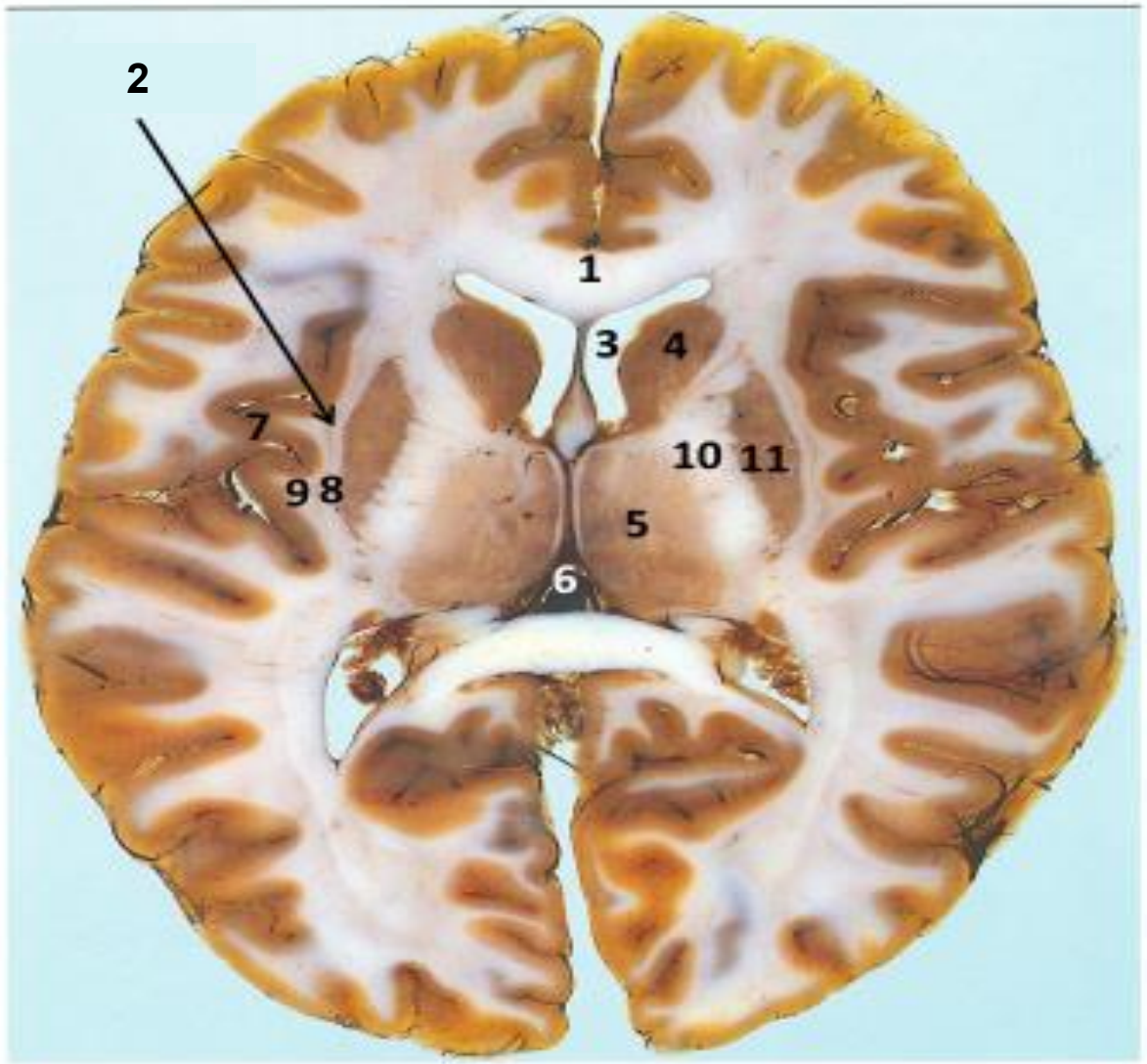
7- Insula

8- External capsule

9- Extreme capsule

10- Internal capsule

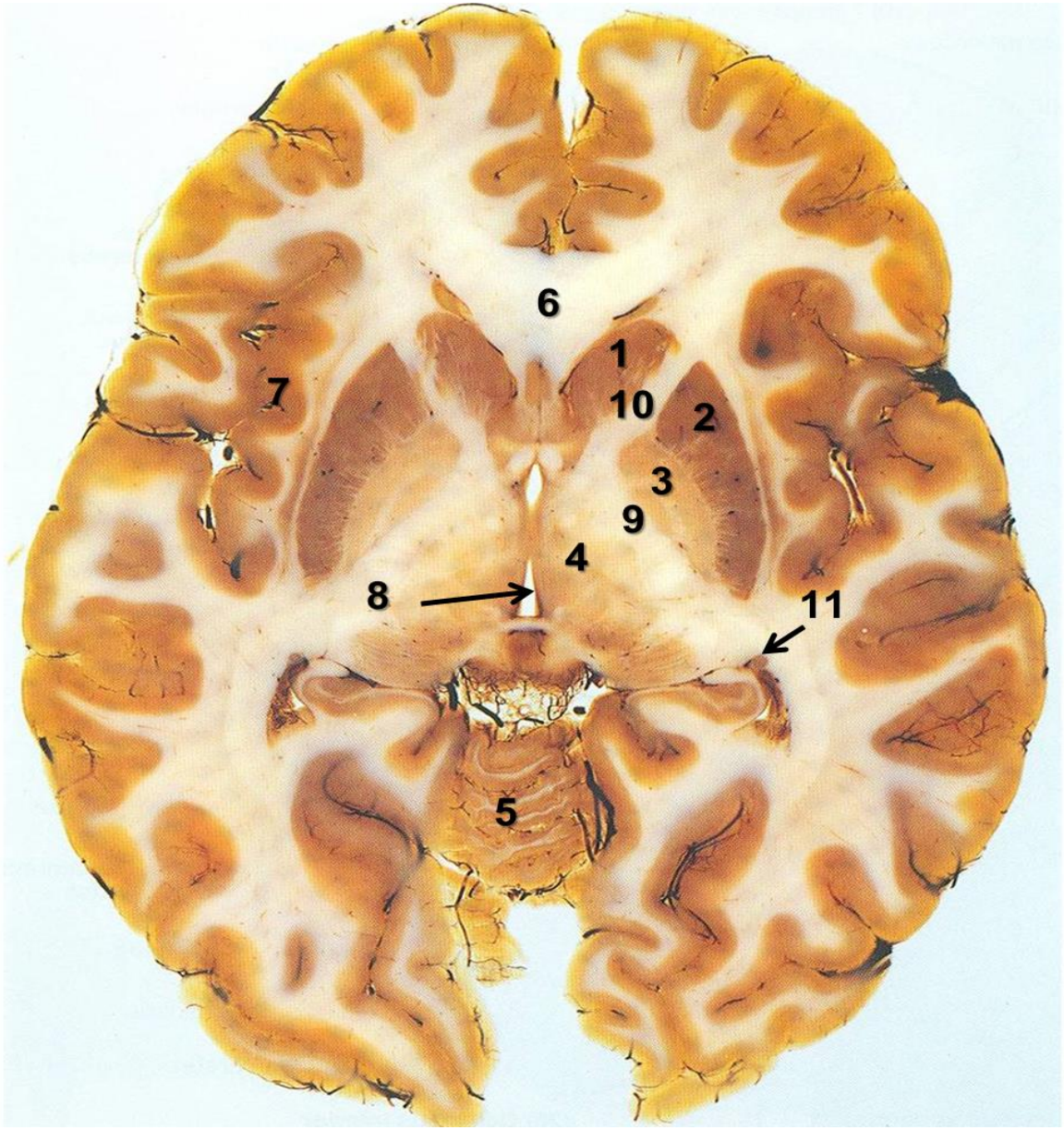
11- Lentiform nucleus



Cerebrum

TRANSVERSE CUT

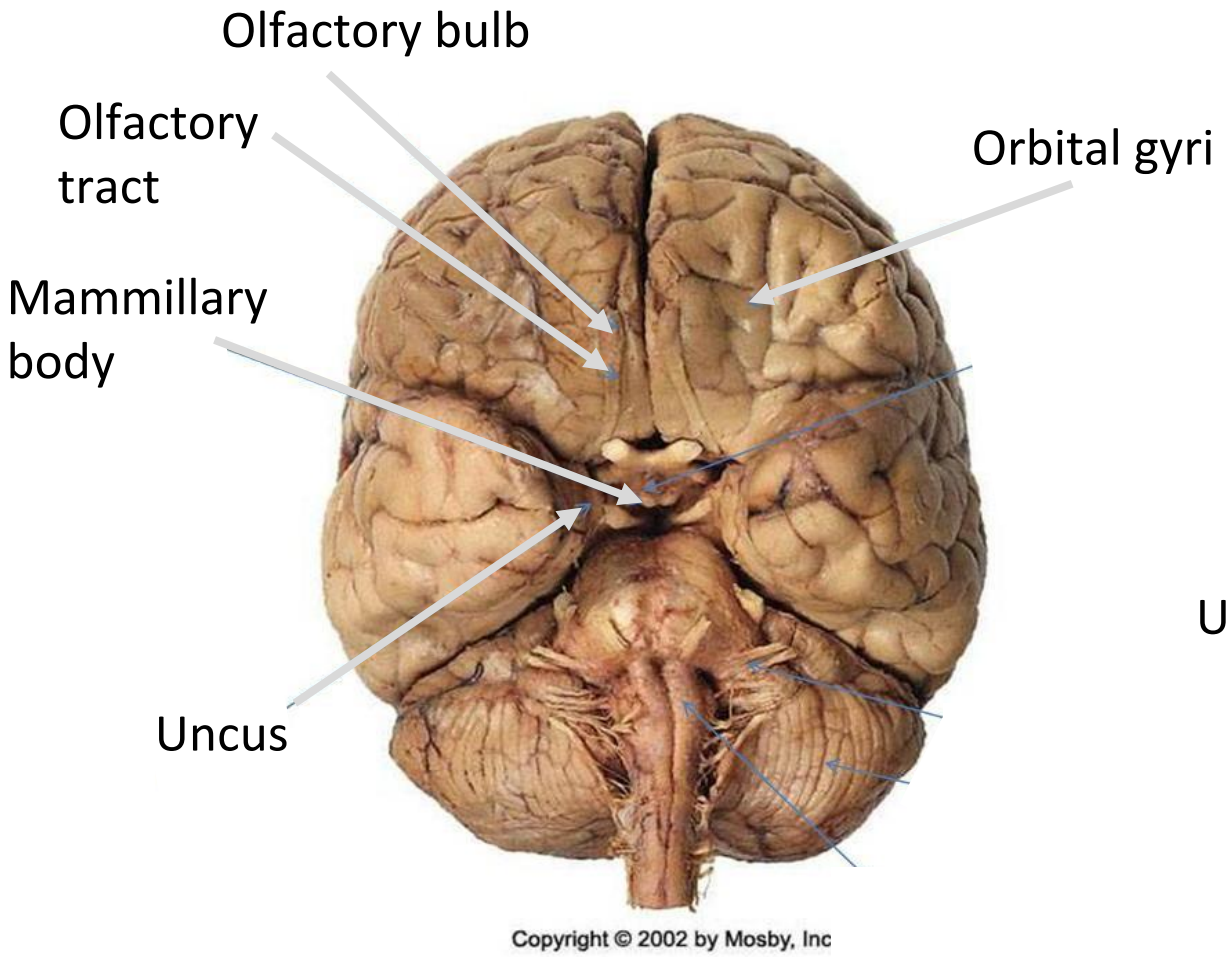
1. Head of Caudate
2. Putamen
3. Globus pallidus
4. Thalamus
5. Cerebellum
6. Corpus callosum
7. Insula
8. Third ventricle
9. Posterior limb of internal capsule
10. Anterior limb of internal capsule
11. Tail of Caudate

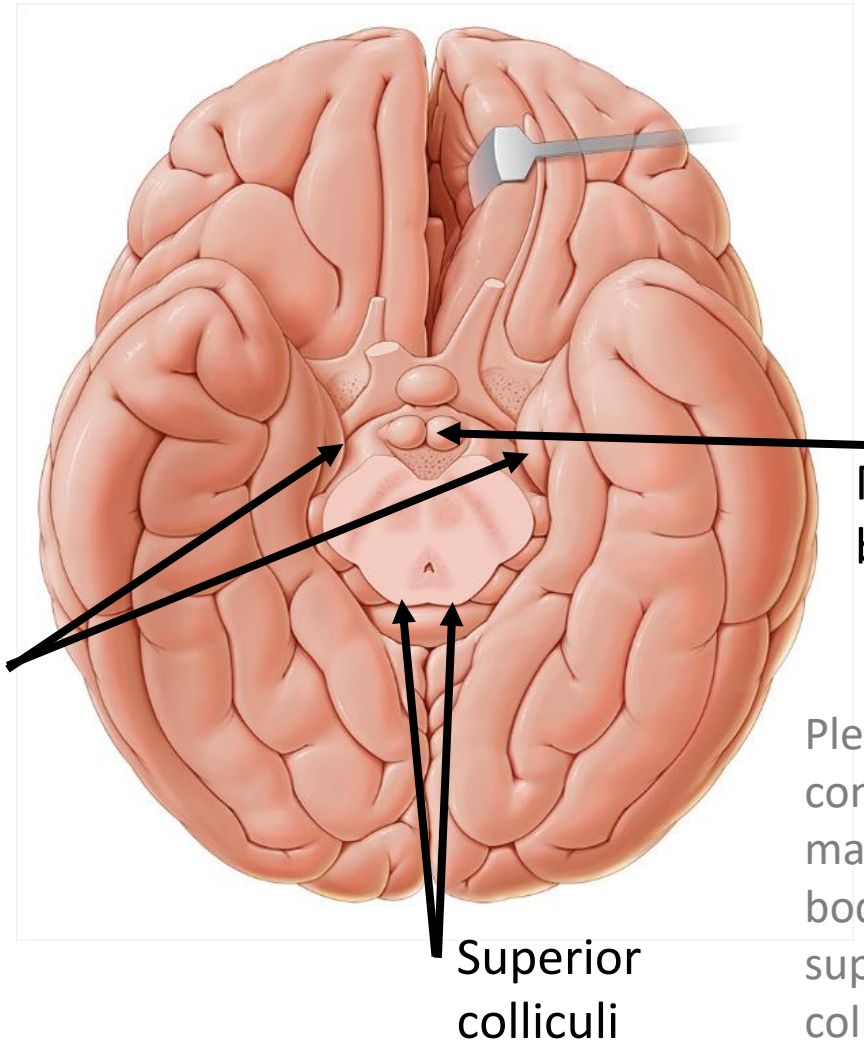


Cerebrum

INFERIOR SURFACE

(this slide is extra recommended by the doctor)





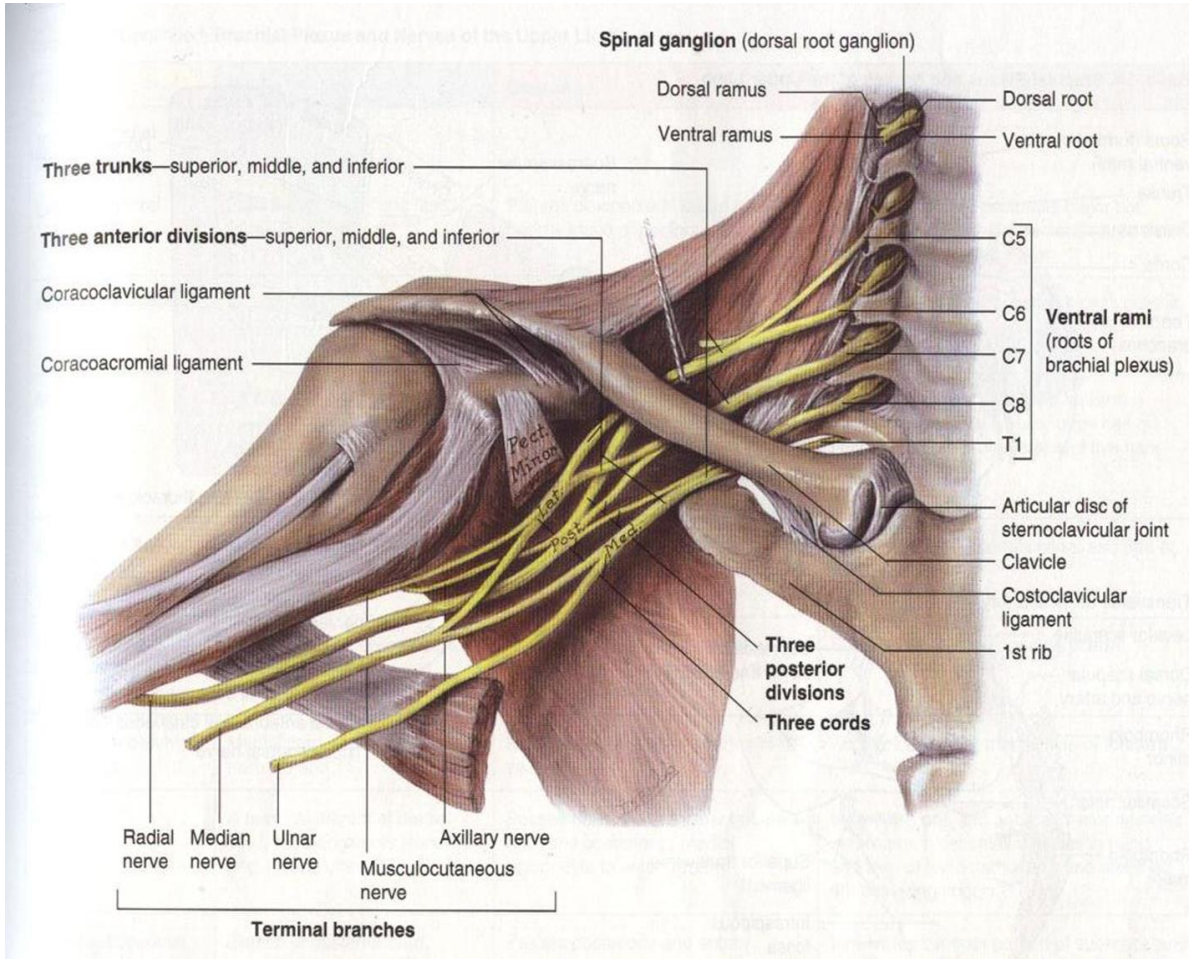
Please DON'T confuse mammillary body and superior colliculus!

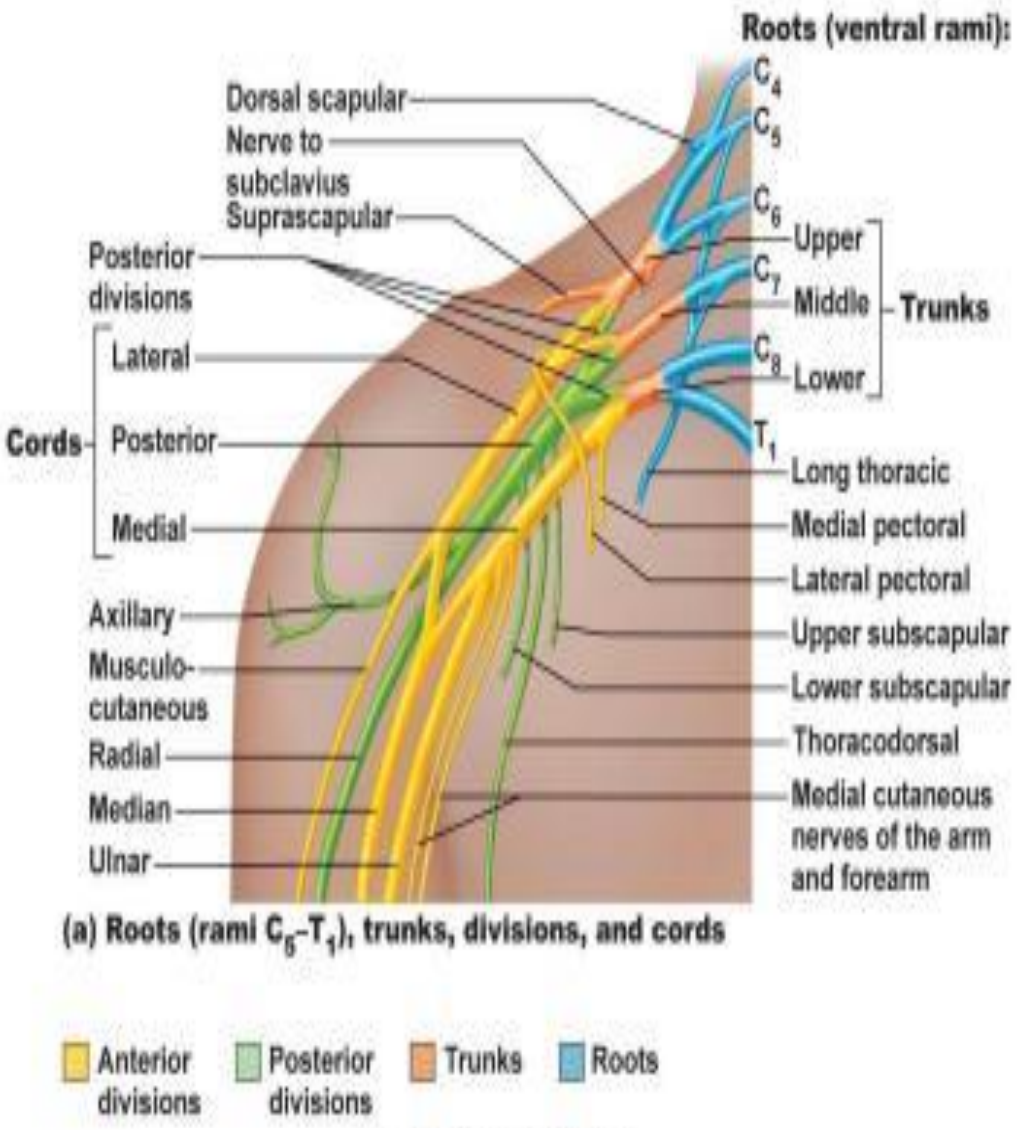
Peripheral Nerves

YOU SHOULD KNOW:

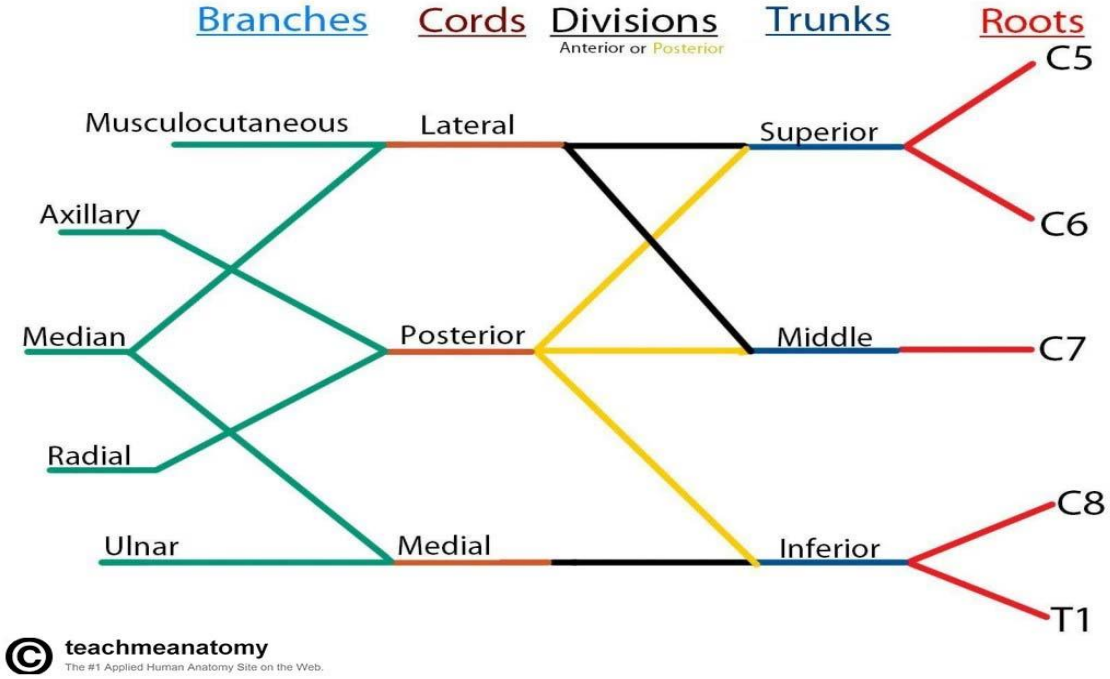
(*Ulnar, median, radial, sciatic, common peroneal & tibial*)

- Root values of each nerve
- Name of plexus from which arise
- Name of cords from which arise
- Name of muscles or groups of muscles supplied by nerve and their main action
- Areas of skin supplied by the nerve
- Name of lesion or deformity caused by nerve injury

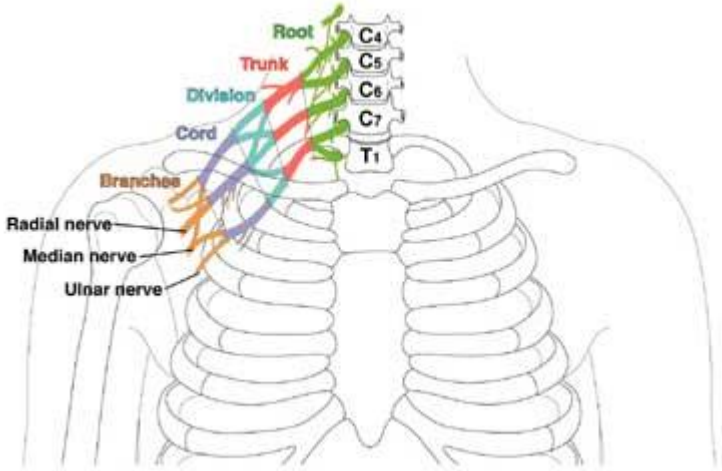




EXTRA picture for understanding



Extra to review how the brachial plexus is formed because they may ask you to identify the **cords**.



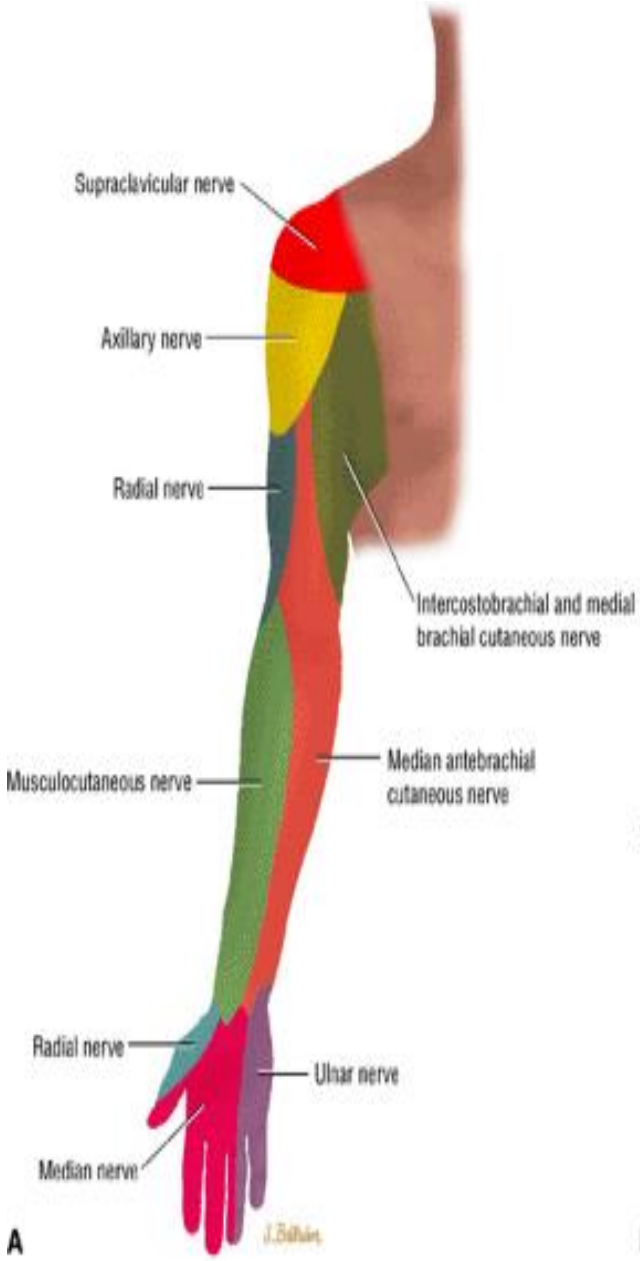
For better understanding you can open the MSK Review File

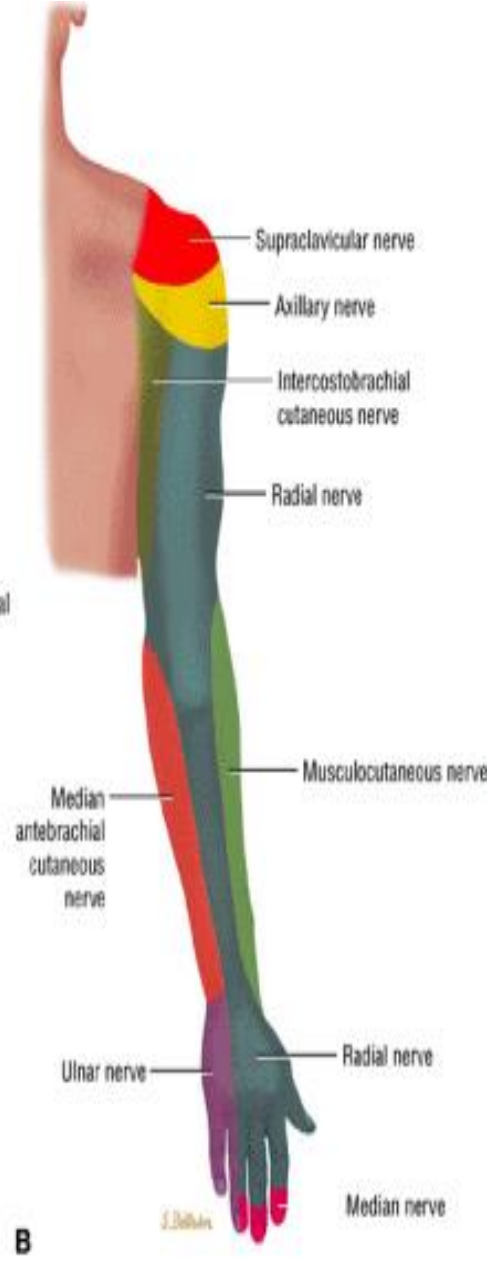
NERVE	*Ulnar*	*Median*	*Radial*
PLEXUS	Brachial Plexus		
ROOT	C8, T1	C5, C6, C7, C8, T1	C5, C6, C7, C8, T1
CORD	Medial cord	Lateral and medial cord	Posterior cord
MUSCLES SUPPLIED	• Flexor carpi ulnaris • medial half of flexor digitorum profundus • 3 hypothenar + interossei muslces • 3rd & 4th lumbricals	• All muscles in the anterior compartment of the forearm (except flexor carpi ulnaris and medial half of flexor digitorum profundus), • three thenar muscles of the thumb + • 1st & 2nd lumbricals.	• Muscles of posterior compartment of forearm. • triceps muscle
MAIN ACTION	**flexion** wrist joint + **flexion** of 4th and 5th fingers + **abduction** & **adduction** of all 4 fingers	**flexion** wrist joint + **flexion** of fingers (1st 2nd 3rd) + **Opposition, abduction, adduction** of thumb	**extension** of the wrist & fingers & elbow
SKIN SUPPLIED في الصوره اوضح	Medial 1 & ½ of palmar & dorsum of hand	Skin over the palmar surface of the lateral three and one-half digits and dorsal aspect of distal phalanges (nail beds) of the same digits.	Skin over the dorsal surface of the lateral three and one-half digits up to the proximal phalanges
NERVE INJURY*	**partial** claw hand	- carpal tunnel syndrome - ape hand	Drop hand. (caused by fracture or dislocation of head of humerus)

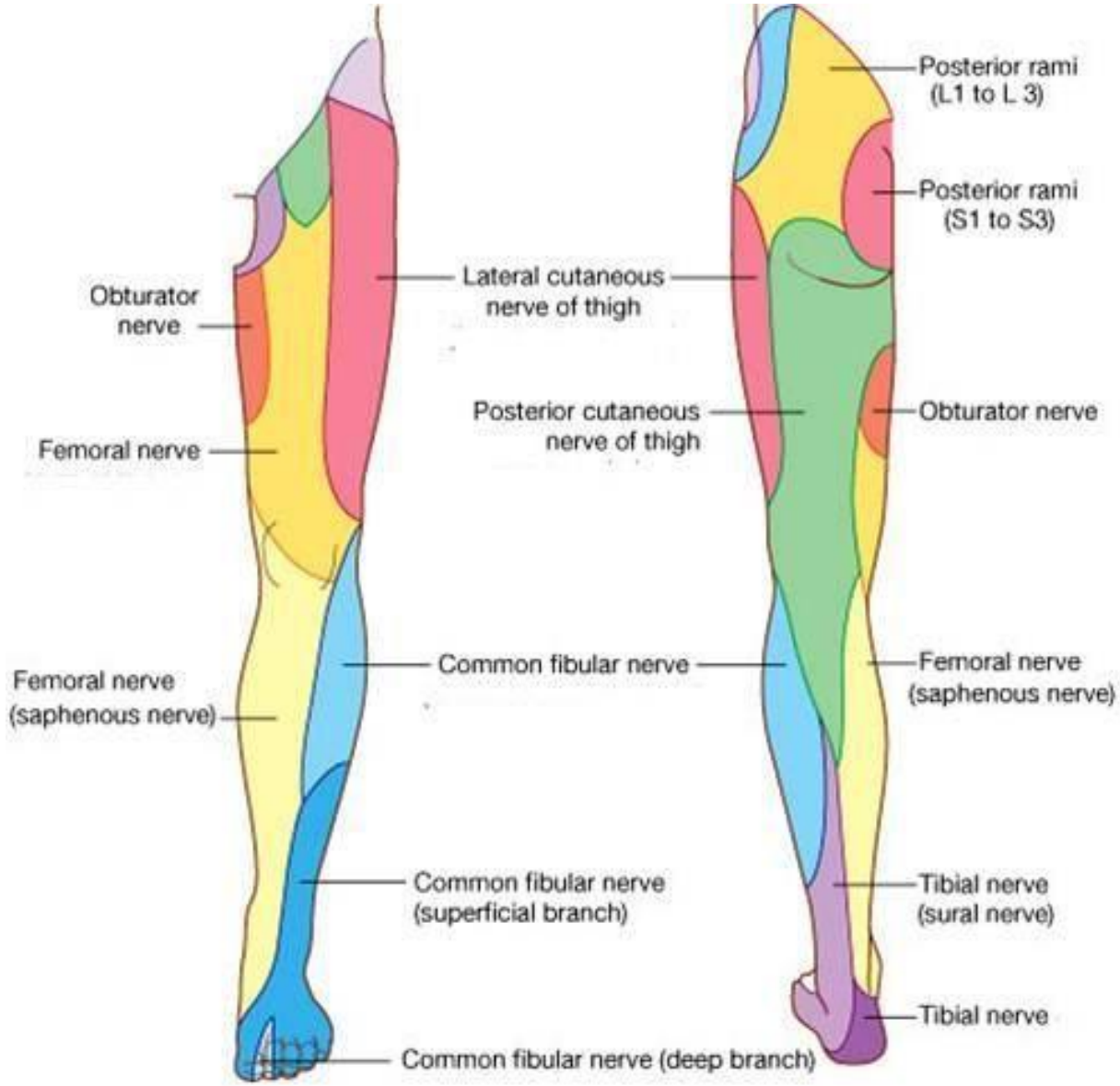
Upper trunk lesion: **Erb-Duchene** Palsy → C5, C6 → arm hanging by side and rotated medially. (forearm extended and pronated)

Lower trunk lesion: **Klumpke** Palsy → C8, T1 → partial claw hand + ape hand

* ***DR. CUMAB***
DR: Drop wrist – Radial nerve
CU: Claw hand – Ulnar nerve
MAB: Median nerve – Ape hand / hand of Benediction


Supraclavicular nerve
Axillary nerve
Radial nerve
Intercostobrachial and medial brachial cutaneous nerve
Musculocutaneous nerve
Median antebrachial cutaneous nerve
Radial nerve
Ulnar nerve
Median nerve
A


Supraclavicular nerve
Axillary nerve
Intercostobrachial cutaneous nerve
Radial nerve
Musculocutaneous nerve
Median antebrachial cutaneous nerve
Ulnar nerve
Radial nerve
Median nerve
B

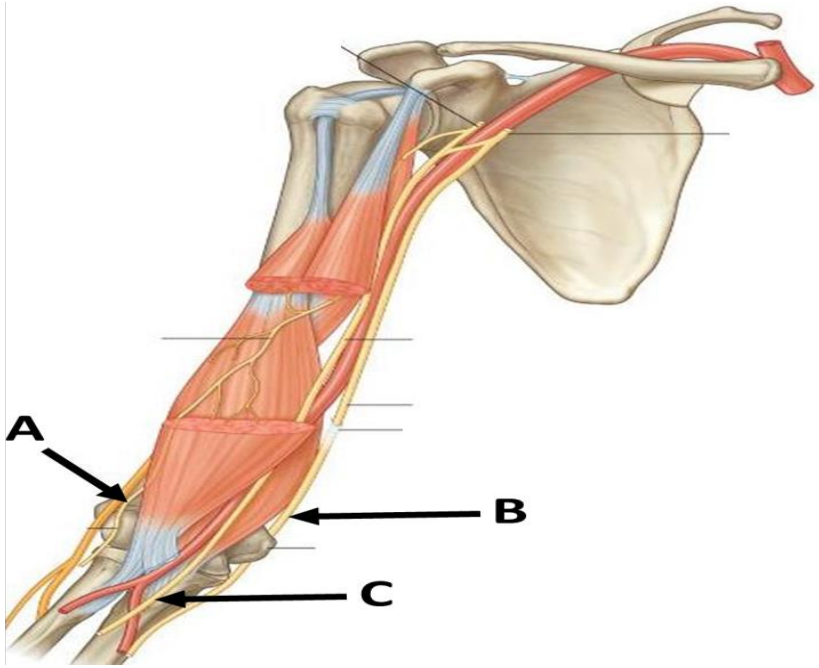

Posterior rami (L1 to L 3)
Posterior rami (S1 to S3)
Obturator nerve
Lateral cutaneous nerve of thigh
Femoral nerve
Posterior cutaneous nerve of thigh
Obturator nerve
Femoral nerve (saphenous nerve)
Common fibular nerve
Femoral nerve (saphenous nerve)
Common fibular nerve (superficial branch)
Tibial nerve (sural nerve)
Tibial nerve
Common fibular nerve (deep branch)

For better understanding you can open the MSK Review File

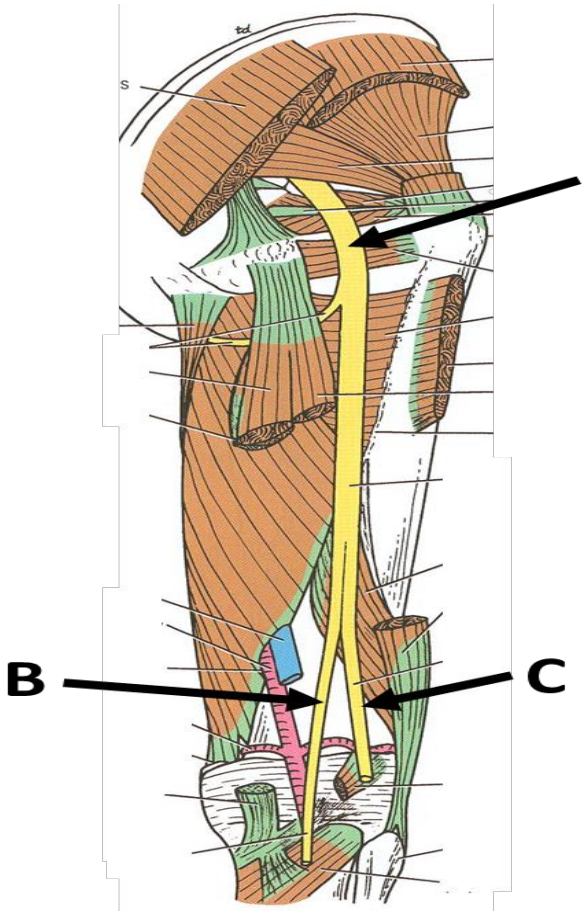
At popliteal fossa, the sciatic nerve divides into 2 terminal branches: common peroneal and tibial nerves.

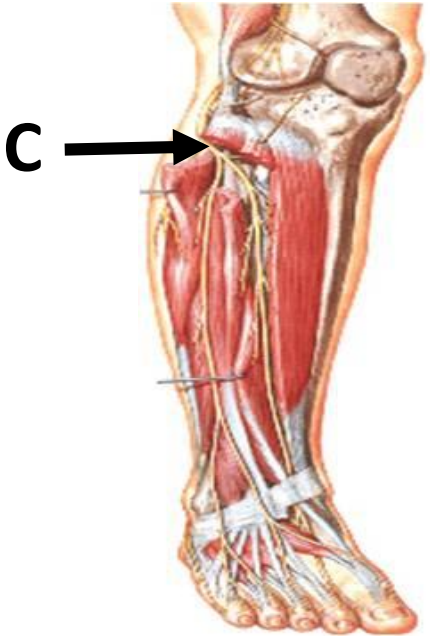
NERVE	*Sciatic*	*Common Peroneal* *(divides into superficial and deep)*	*Tibial*
PLEXUS	Lumbosacral Plexus		
ROOT	L4, L5, S1, S2, S3	L4, L5, S1, S2, S3	L4, L5, S1, S2, S3
MUSCLES SUPPLIED	• muscles of the posterior thigh • hamstring portion of the adductor magnus. Indirectly innervates (via its terminal branches) the muscles of the leg and foot.	• Lateral and, • anterior compartment of leg	• Posterior compartment of leg • plantar muscles of foot
MAIN ACTION	**Flex** knee & **Extend** thigh	**dorsiflexors** of ankle **extensor** of toes, eversion	**planterflex** foot, **flex** digit, inversion
SKIN SUPPLIED في الصوره اوضح	No direct sensory functions. Indirectly innervates (via its terminal branches) All skin of foot& leg except medial side of leg and foot (saphenous n.)	Anterolateral side of leg + all the skin of dorsum of the foot except medial side of foot (saphenous n.) and lateral side of foot (sural n.)	Lateral side of leg and sole of foot.
NERVE INJURY	Its injury will affect the flexion of knee, extension of hip, all movements of leg & foot, as well as loss of sensation of skin of leg & foot (except areas supplied by saphenous branch of femoral nerve) **Foot drop** and stamping gait.	Equinovarus + drop foot	Calcaneovalgus + loss of plantar-flexion

Peripheral Nerves



A. Radial nerve
B. Ulnar nerve
C. Median nerve



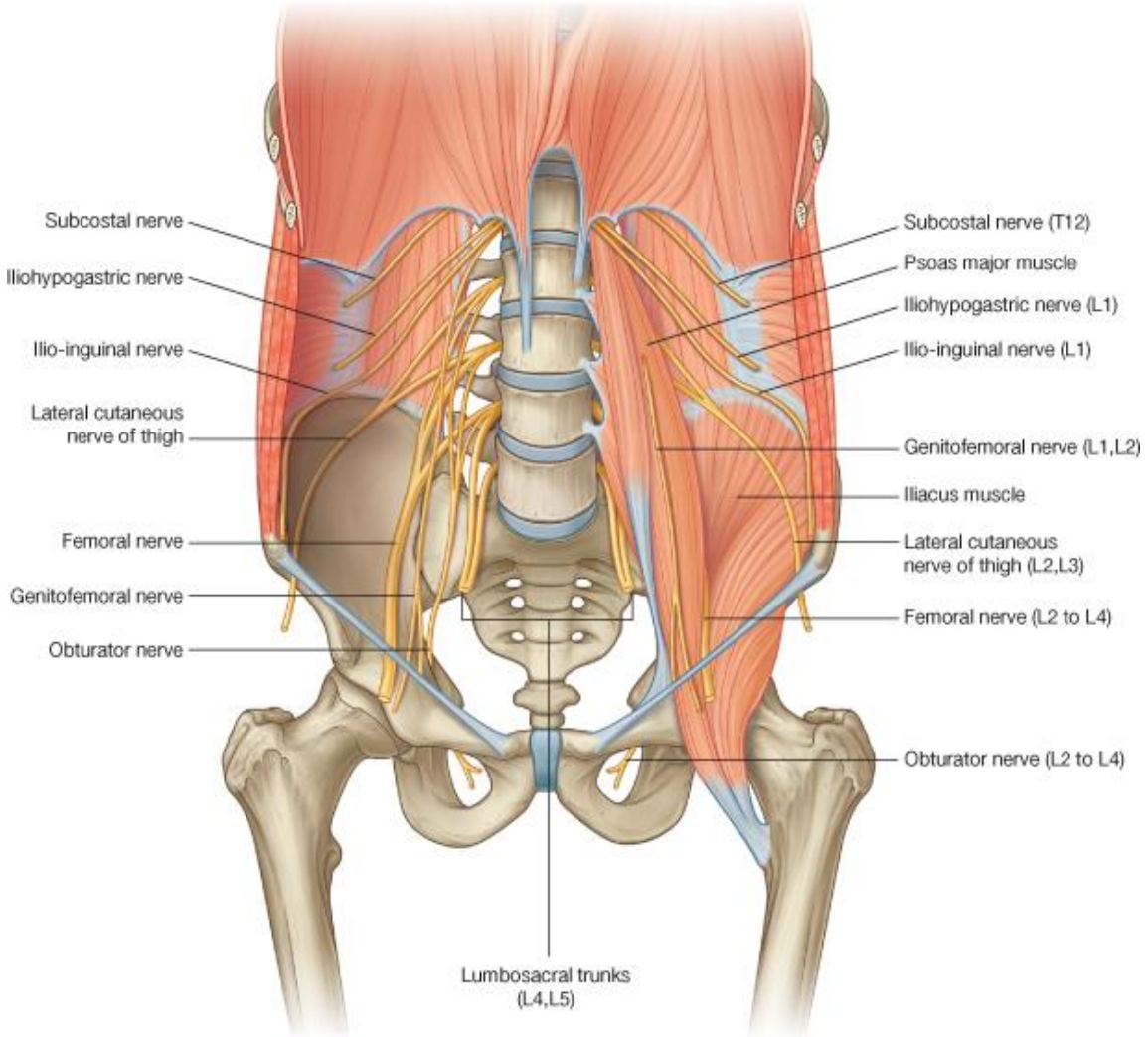


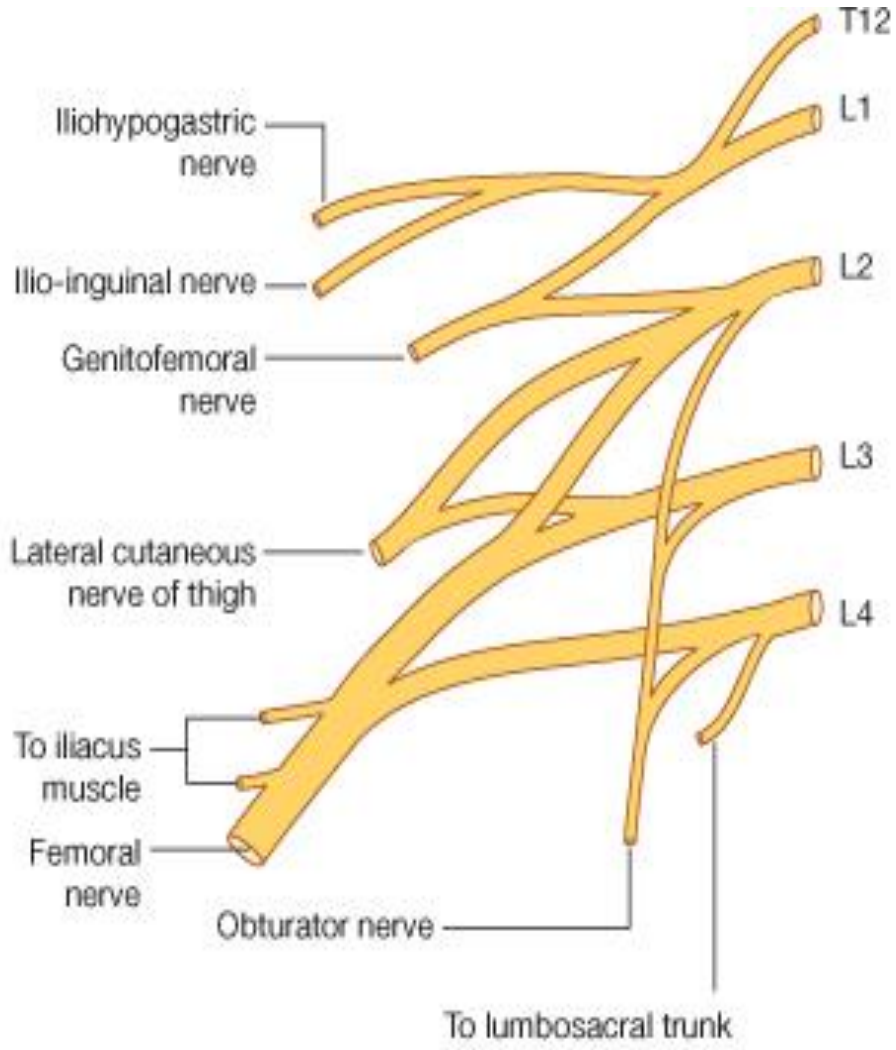
A. Sciatic nerve
B. Tibial nerve
C. Common peroneal nerve

(this slide is extra recommended from the doctor)

NERVE	*Femoral*	*Obturator*	*Iliohypogastric*	*ilioinguinal*
PLEXUS	Lumbar Plexus			
ROOT	L2, L3, L4	L2, L3, L4	L1	L1
MUSCLES SUPPLIED	To anterior compartment of thigh.	Medial compartment.	To anterior abdominal wall	To anterior abdominal wall
MAIN ACTION	Extension of knee + flexion of hip	Adductors of hip		
SKIN SUPPLIED	It supply the antero-medial aspect of thigh and medial side of leg and foot	It supply the skin over the medial aspect of the thigh		
NERVE INJURY	Motor effect: • Wasting of quadriceps femoris. • Loss of extension of knee. • Weak flexion of hip (psoas major is intact). Sensory effect: • loss of sensation over areas supplied antero-medial aspect of thigh & medial side of leg & foot.			

(this slide is extra recommended from the doctor)

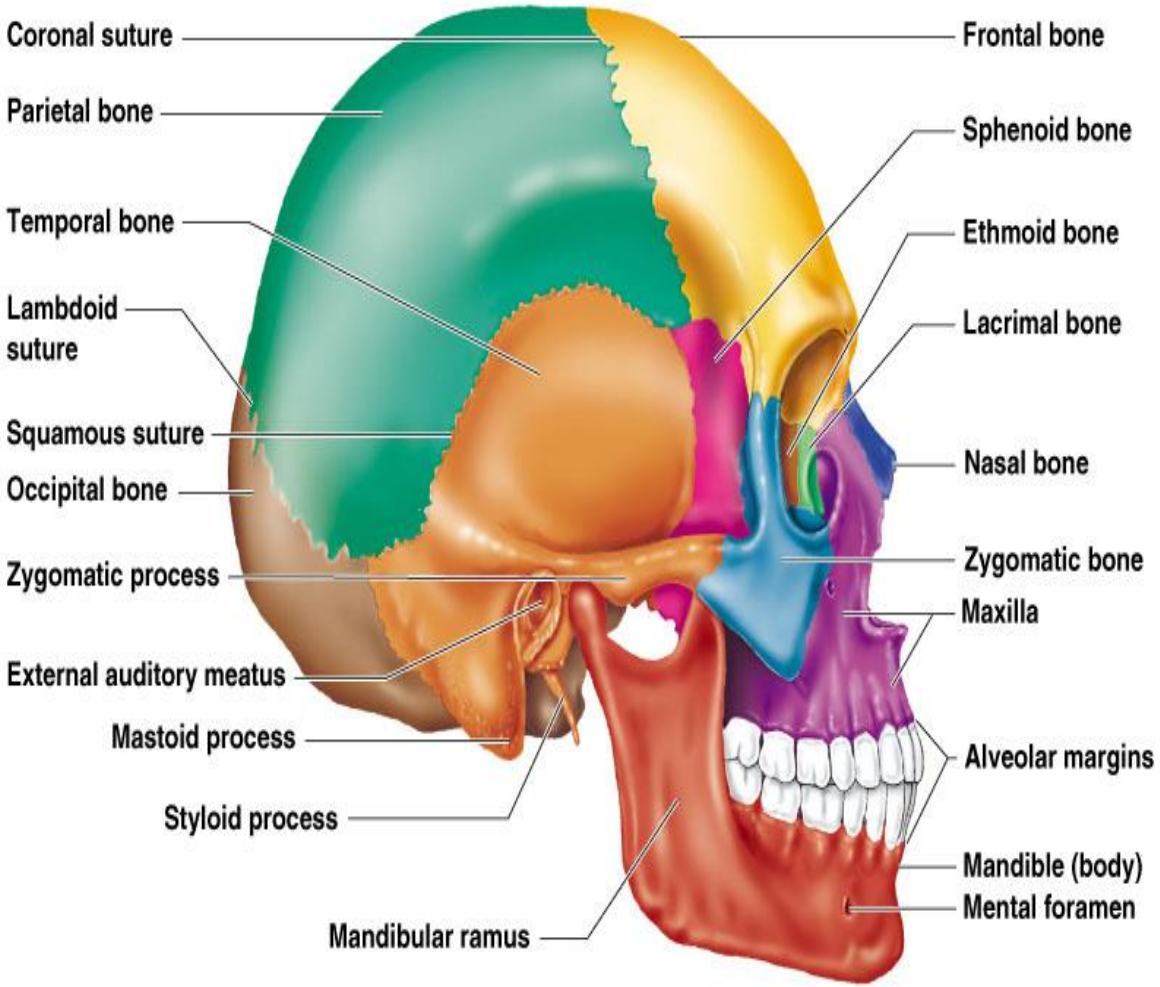


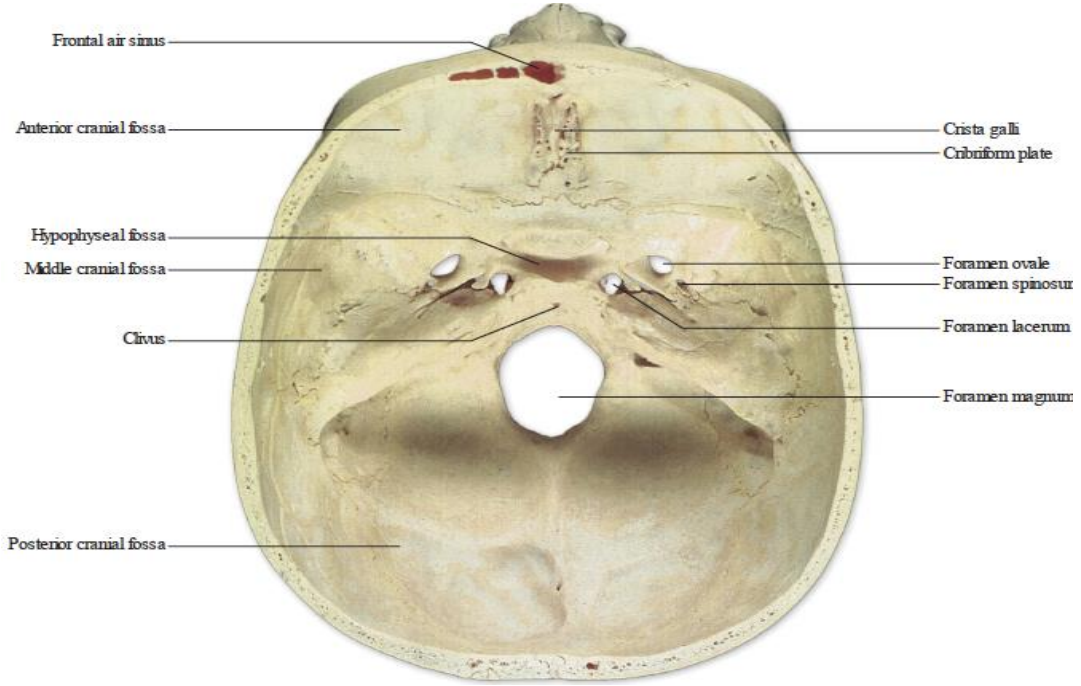


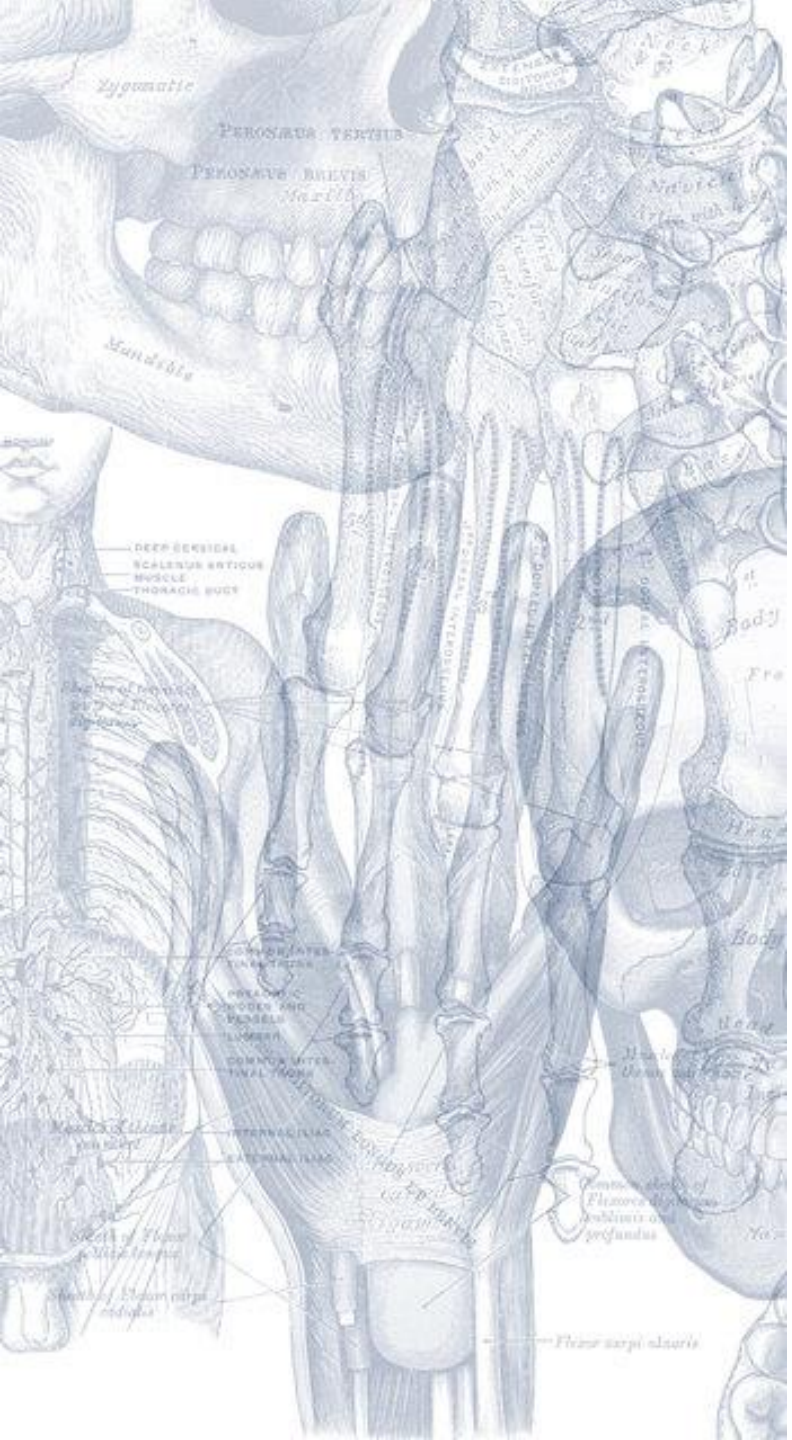
Skull

not important!
ما قد جاء عليها سؤال

(this slide is extra recommended from the doctor)







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Practice Test

Extra Pictures For Practice

Feedback

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