



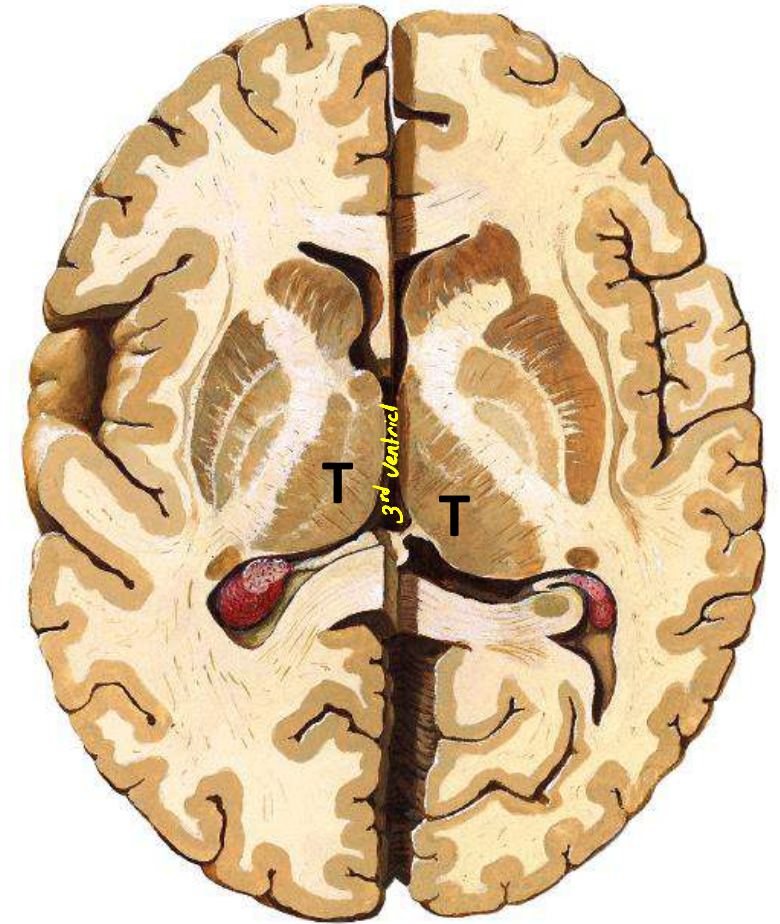
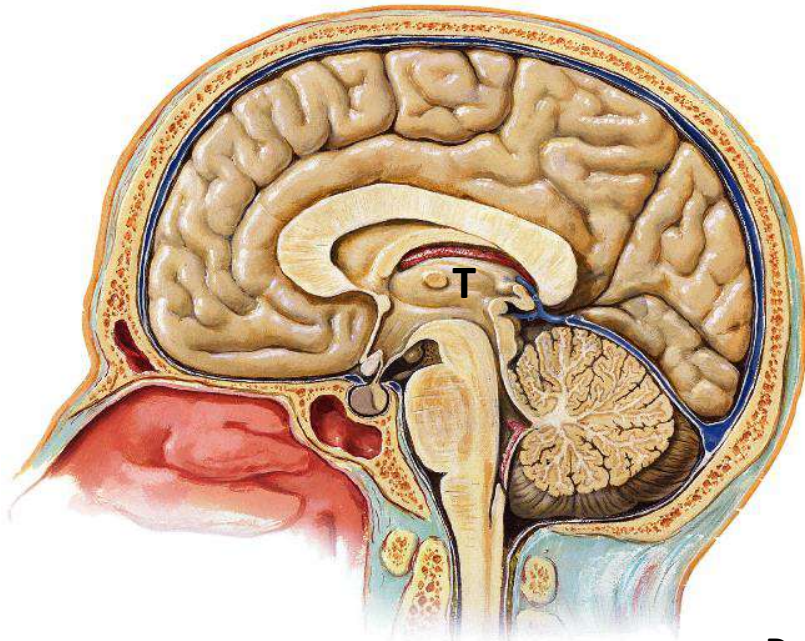
General Anatomy

Lecture 24: Nervous System (2)

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Diencephalon

- * It consists of thalamus (T) & hypothalamus (H).
- * The cavity between the 2 thalami is called the **third ventricle**.

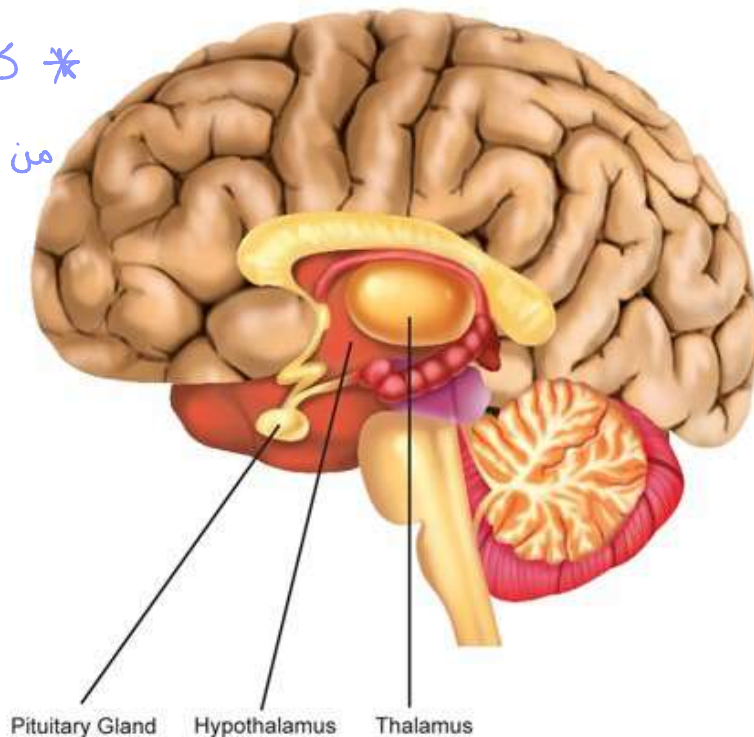


Diencephalon (contd)

A. Thalamus:

- * It is an **oval mass of grey matter** that acts as **gate way to cerebral cortex**.
- * It is a center for **all sensations except smell**.

* كل ال Sensations المعمولة
من الجسم كله قبل ما توصل لل
Sensory areas الموجودة
بال Cerebral cortex
لا بد أن تقرب ال
Thalamus



B. Hypothalamus:

* Lies below thalamus, separated from it by hypothalamic sulcus.

* Functions:

1. Control of autonomic nervous system.

بعداد من اللي هيشتغل
Sympathetic ←
parasympathetic ←

2. Regulates fluid intake and body temperature.

مراكز العطش والتحكم في حرارة الجسم

3. Controls emotions, behavior and biological clock.

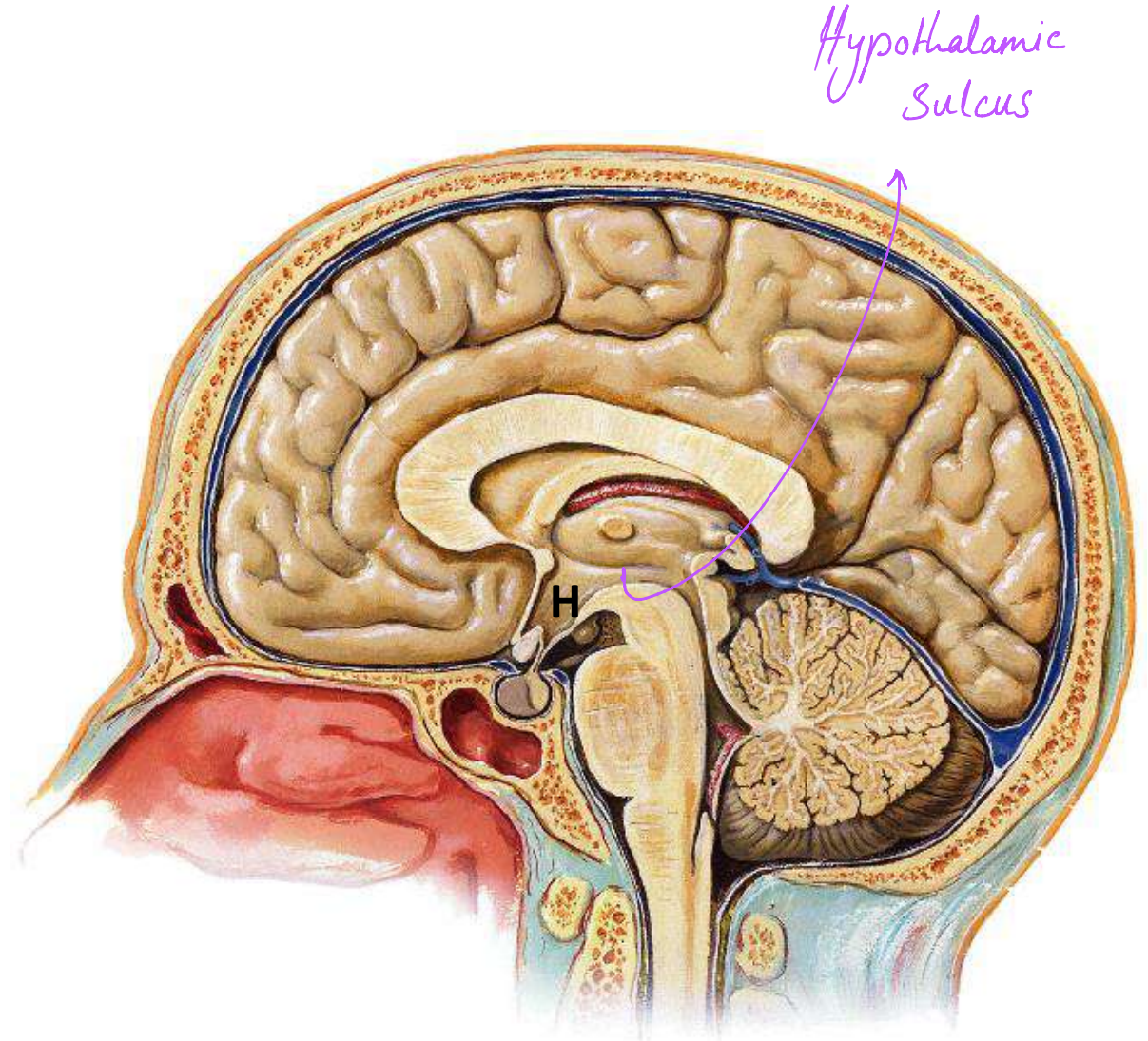
4. Controls endocrine system.

كانوا فكريين زمان انه ال لاندوا Pituitary هي

المسؤولة عن (4) بس اكتشفوا انه ال Hypothalamus

هي اللي بتتحكم بال P.G

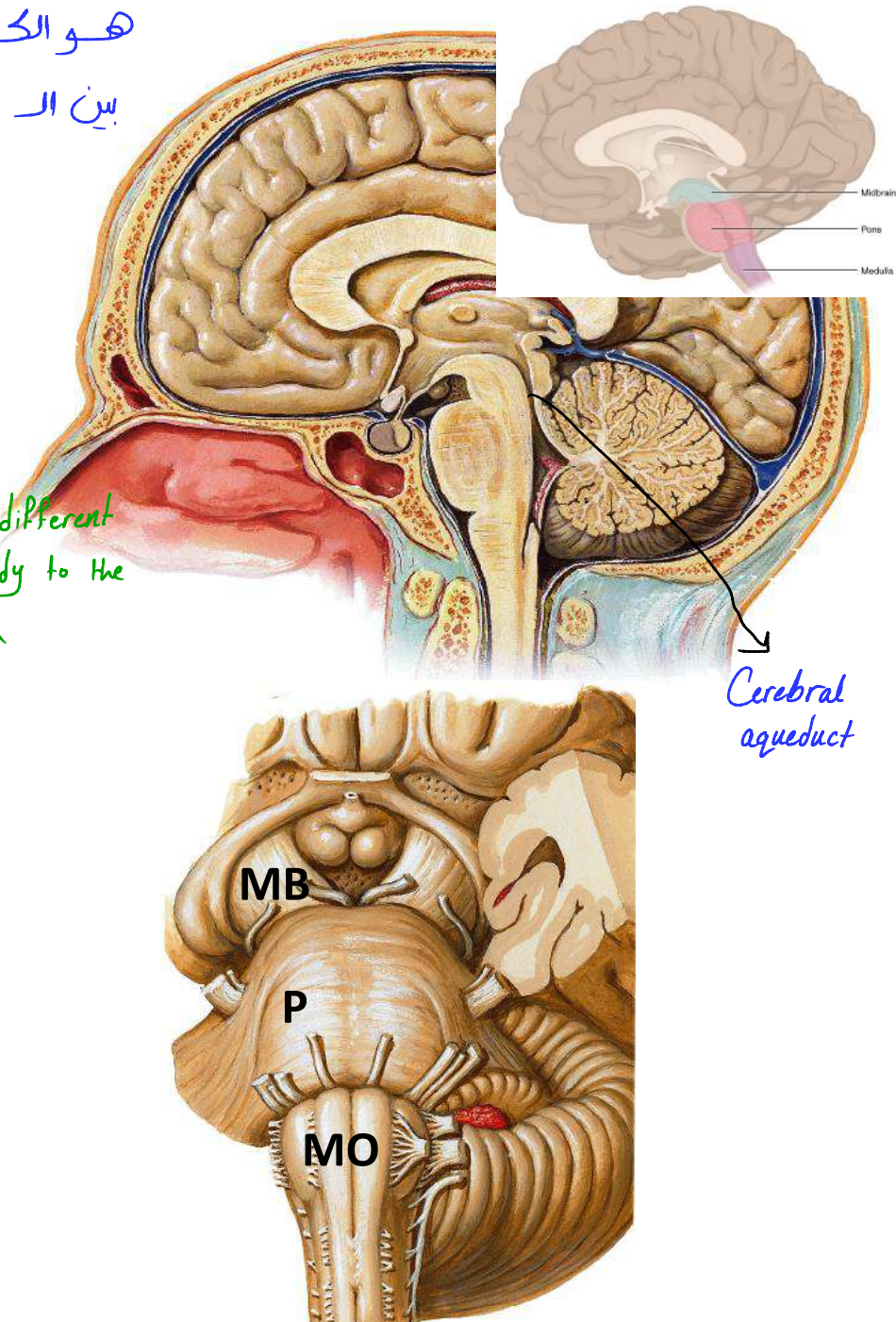
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Brain Stem

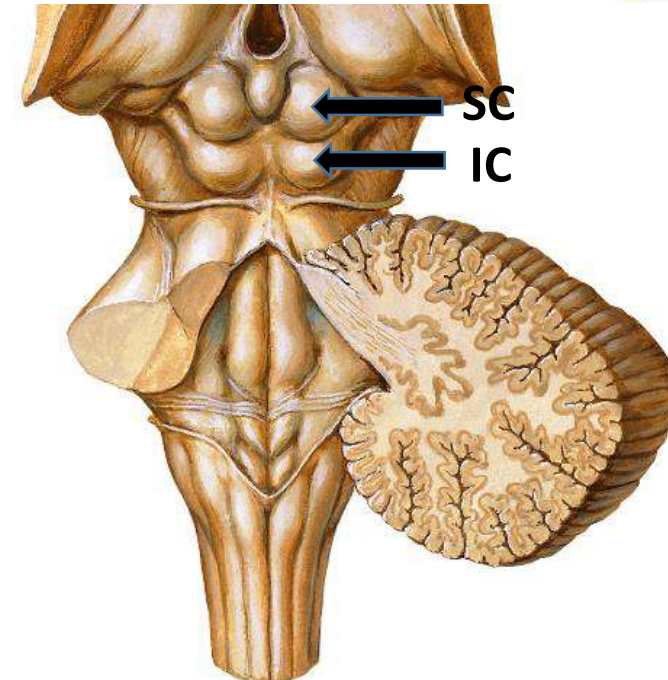
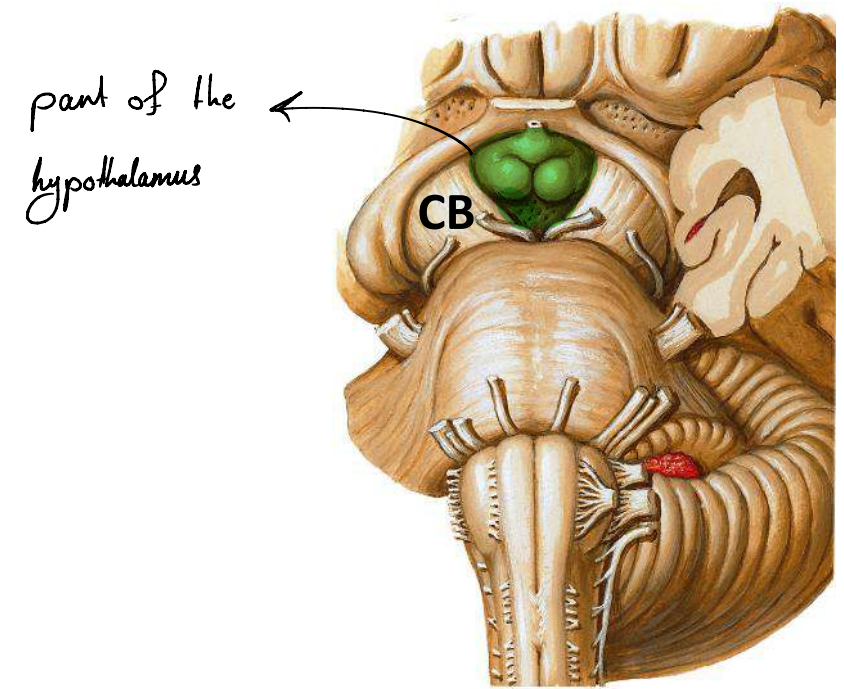
هو الكوبري / الجسر
بين الـ Cerebrum & spinal cord

- * **It connects:** cerebrum with spinal cord.
- * **It consists of:** mid brain (MB), pons (P) & medulla oblongata (MO).
اللي تتكلم وتعمل Spinal cord
- * **It is traversed by:** ascending and descending (tracts). = Bundles of nerve fibers
صاعدة
Carrying sensations from different parts of the body to the cerebral cortex
حايطة
Carrying motor orders to the different muscles of the body
- * **It contains:** scattered masses of grey matter forming nuclei including nuclei of cranial nerves.
- * **Cranial nerves:** are attached to the surface of brain stem during their exit.



Midbrain

- * Shortest part of brain stem.
- * Connects cerebrum to pons.
- * Traversed by a canal called cerebral aqueduct.
- * Formed of 2 halves anteriorly, each half is called cerebral peduncle (CB).
- * Posteriorly its shows 4 rounded elevations; 2 superior colliculi (SC) and 2 inferior colliculi (IC).



Sup. Colliculus	Sup. Colliculus
Inf. Colliculus	Inf. Colliculus

Midbrain

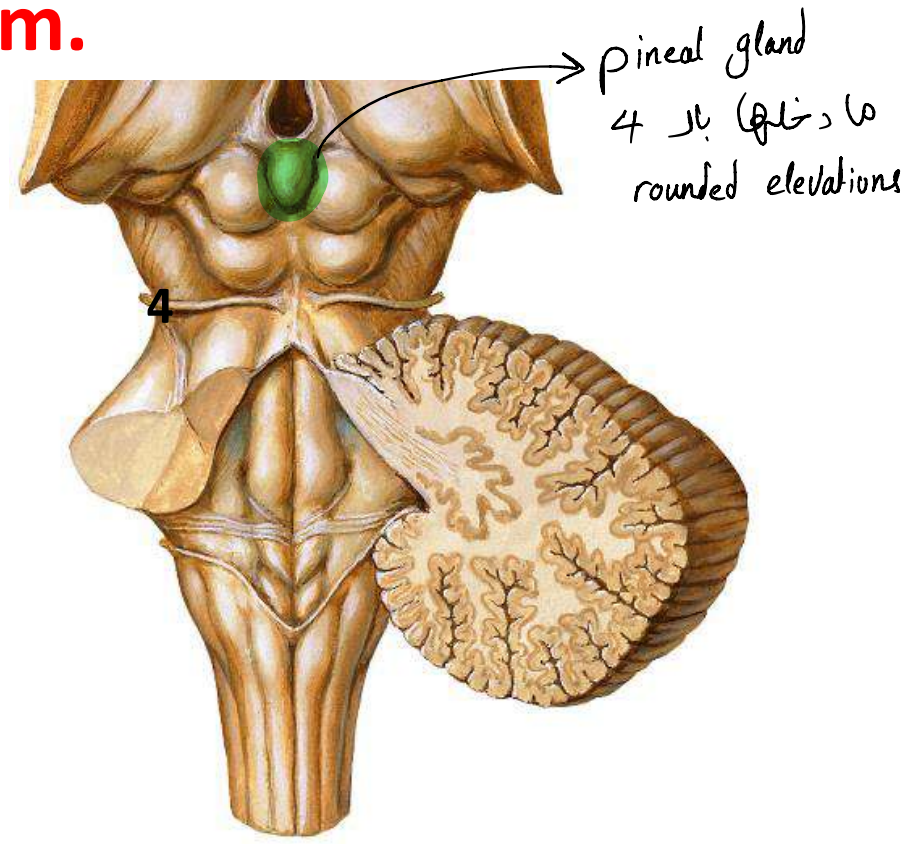
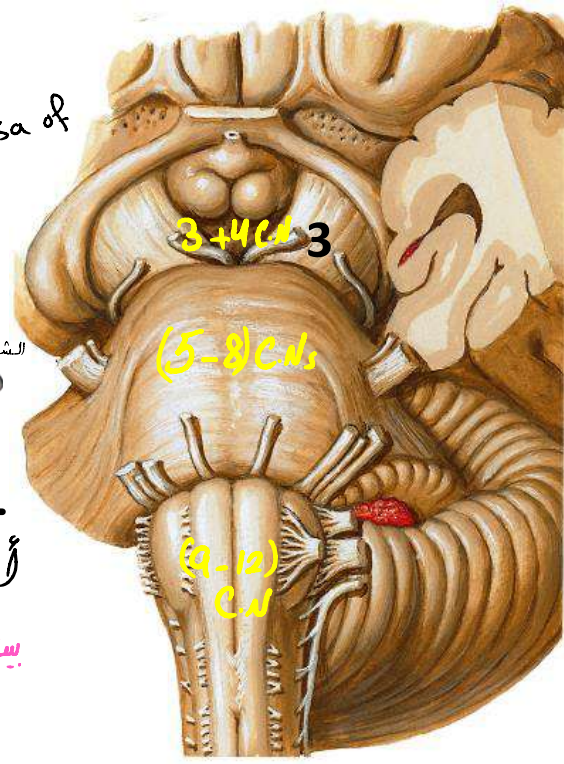
* 3rd (occulomotor) & 4th (trochlear) cranial nerves are attached to mid brain; 3rd cranial nerve emerges from anterior surface while **4th cranial nerve** is the only cranial nerve that emerges from posterior surface of brain stem.

1st C.N [Olfactory N.]
 → From Nose mucosa of

2nd C.N [Optic N.]
 → From Retina الشبكية

ملحوظة: علاقة بال Brainstem

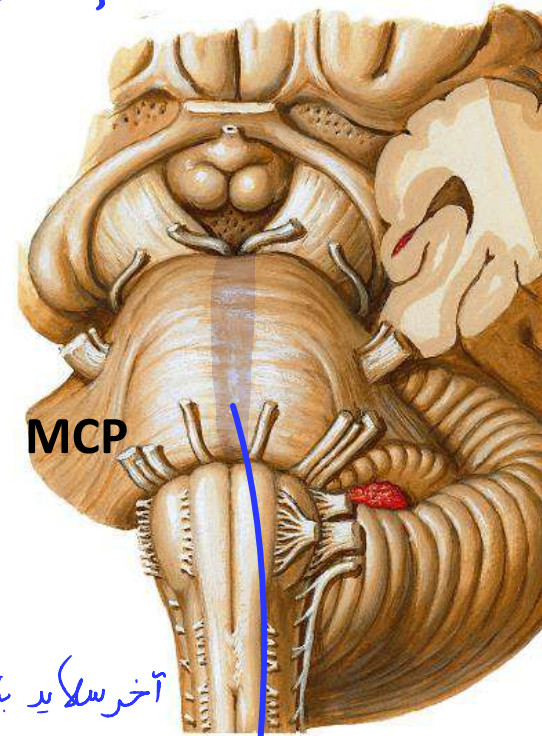
(3rd - 12th) C.Ns أقفا
 يبدأوا ويخرجوا من الـ
 Brainstem



→ Pineal gland
 ما داخلها بار 4
 rounded elevations

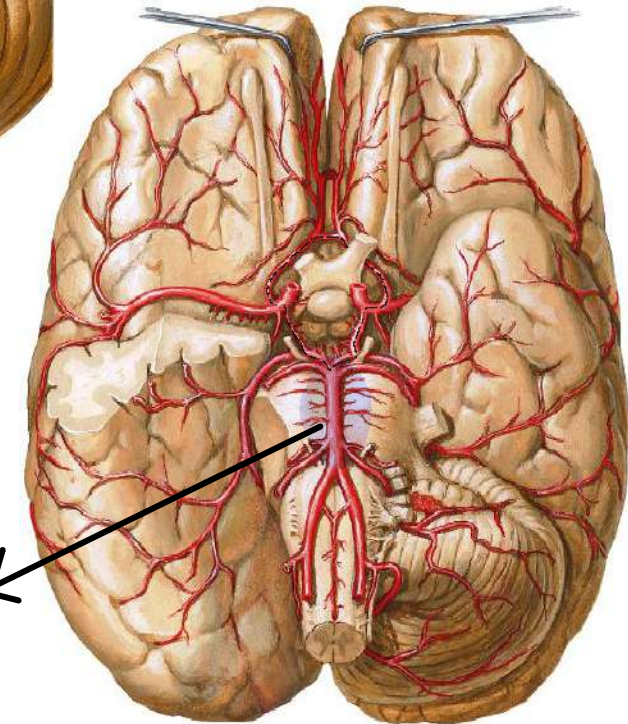
Pons = Bridge en Français

- * **One inch long.** ≈ 2.5 cm
- * **Continuous with:** medulla inferiorly and mid brain superiorly.
- * **Anterior surface:** shows **transverse pontine fibers** which are connected to the cerebellum via **middle cerebellar peduncle (MCP)**.
To be noticed $\left\{ \begin{array}{l} \rightarrow \text{cerebellar} \rightarrow \text{related to cerebellum} \\ \rightarrow \text{cerebral} \rightarrow \text{related to cerebrum} \end{array} \right.$
- * **Anterior surface:** shows a groove in the midline which lodges the basilar artery (**sulcus basilaris**).



Groove/Sulcus Basilaris

موجود فيه ال
Basilar artery



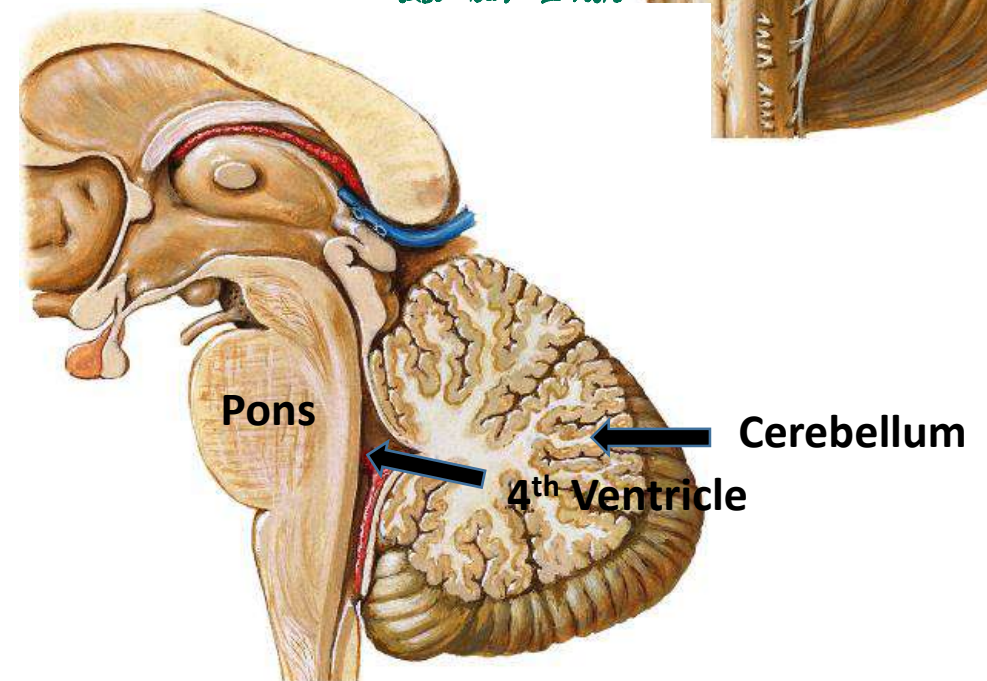
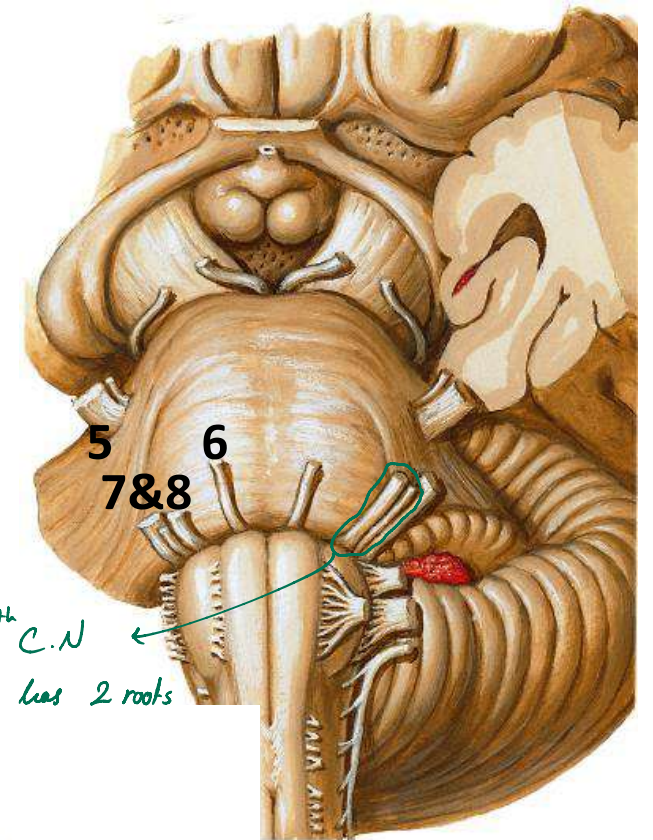
* **Trigeminal nerve (5th cranial nerve)** is attached by its 2 roots to the anterior surface of pons midway between the superior and inferior borders.

Cuz it is a mixed nerve contain :

Sensory part Large root
& Motor part Small root

* **Abducent (6th), facial (7th) and vestibulocochlear (8th) nerves** are attached to the lower border of pons from medial to lateral.

* **Posterior surface:** is related to the **cerebellum** & separated from it by the cavity of **4th ventricle**.



Medulla Oblongata

- * It is continuous superiorly with pons and inferiorly with spinal cord.
- * Its anterior surface shows anterior median fissure.
- * Lateral to the fissure → there are 3 elevations:

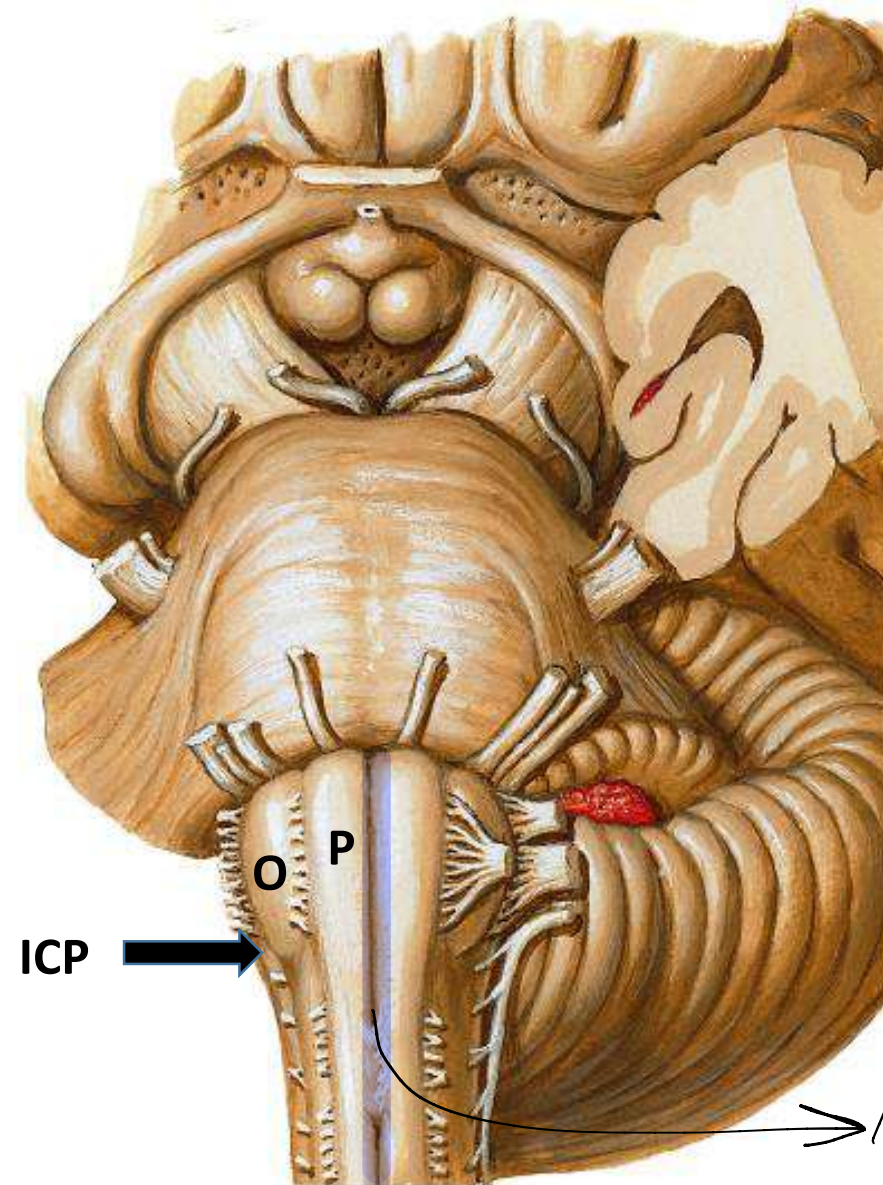
a. Pyramid (P).

b. Olive (O).

c. I.C.P (Inferior cerebellar peduncle).

which connects cerebellum to medulla

From Medial to Lateral

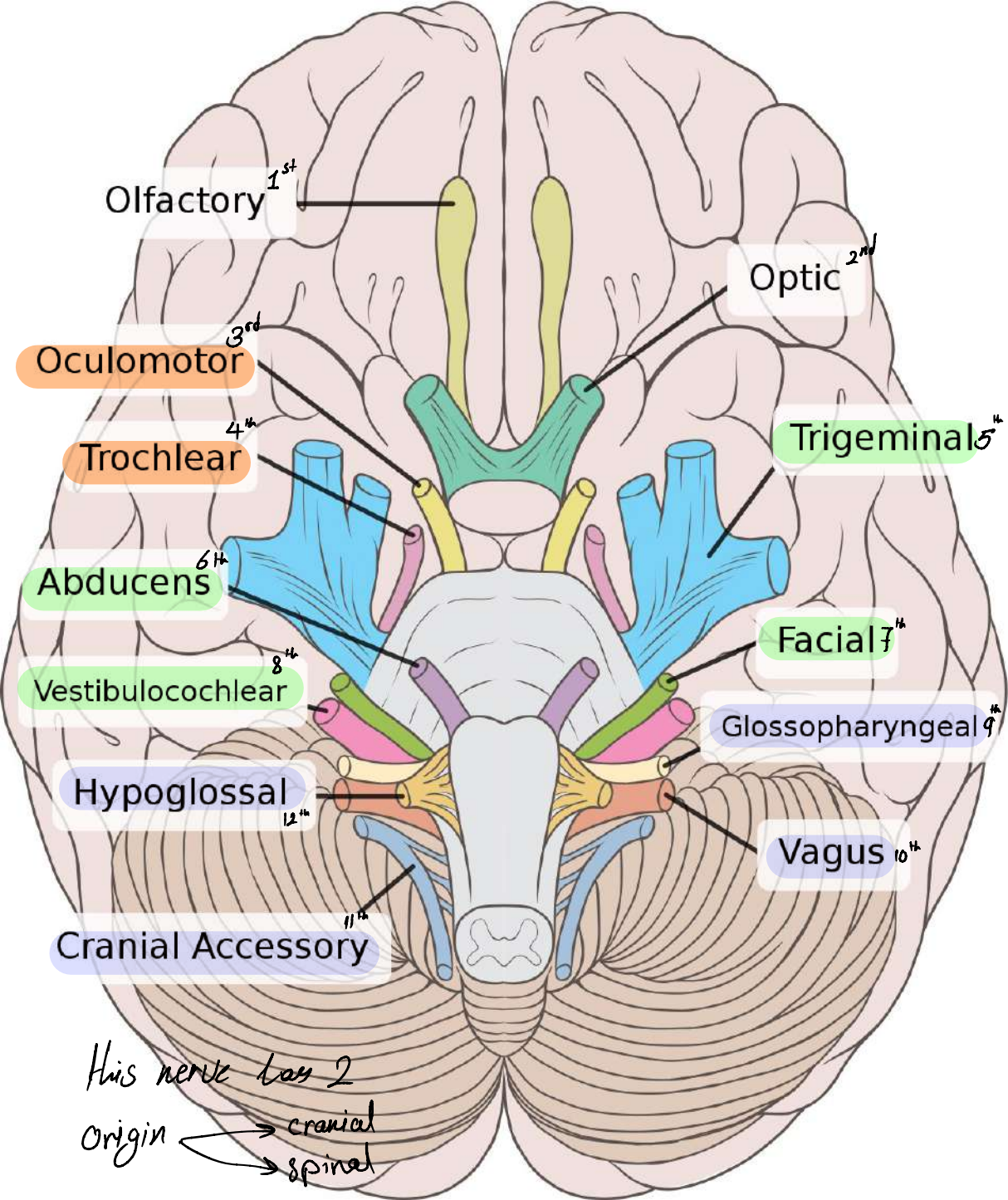


Ant. median Fissure

Medulla Oblongata (contd)

- * **Hypoglossal (12th cranial nerve)**: is attached to the groove between pyramid & olive.
- * **Glossopharyngeal (9th), vagus (10th) and accessory (11th)**: are attached to the groove between olive & I.C.P.





Olfactory ^{1st}

Optic ^{2nd}

Oculomotor ^{3rd}

Trigeminal ^{5th}

Trochlear ^{4th}

Abducens ^{6th}

Facial ^{7th}

Vestibulocochlear ^{8th}

Glossopharyngeal ^{9th}

Hypoglossal ^{12th}

Vagus ^{10th}

Cranial Accessory ^{11th}

*This nerve has 2
origin → cranial
→ spinal*

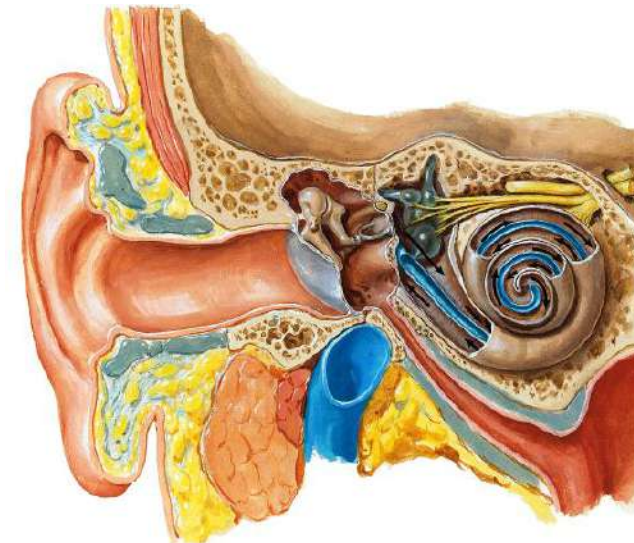
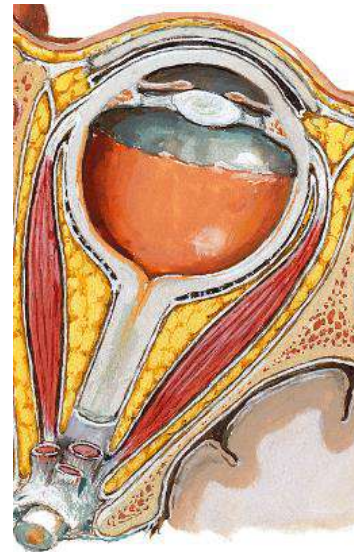
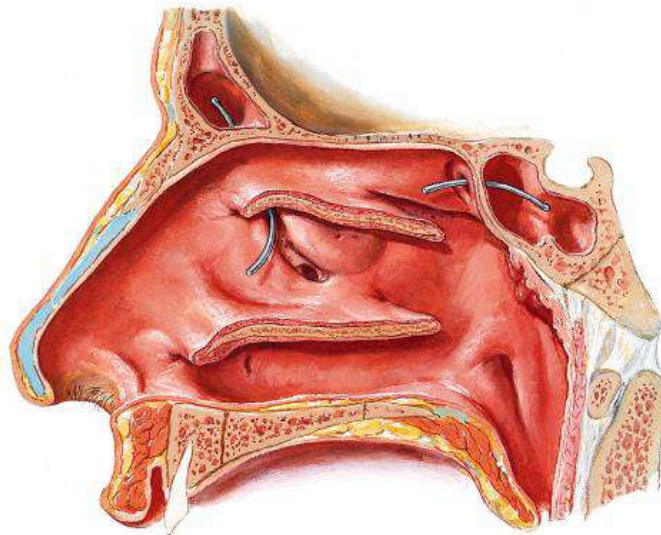
Cranial nerves

A. Three Purely Sensory Nerves:

1 st	Olfactory	Sensory for smell	Arises from olfactory epithelium
2 nd	Optic	Sensory for vision	Arises from ganglionic cells of retina
8 th	Vetibulo-cochlear ↓ 5	Responsible for hearing & equilibrium	

من الـ E.T العيظن الأنف

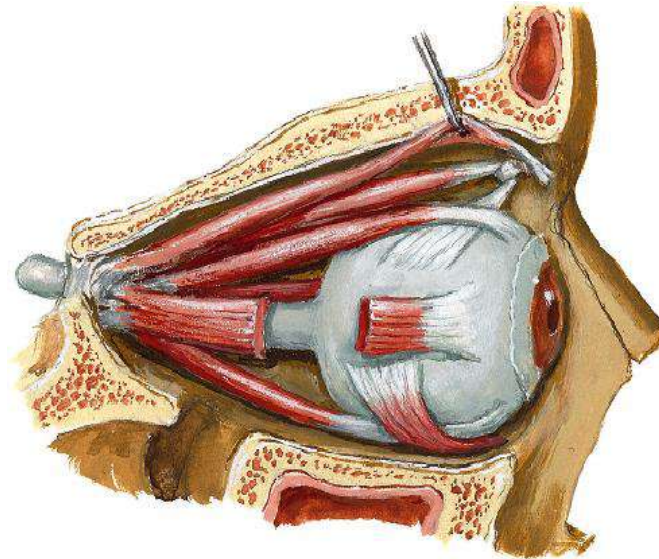
Contain receptors of smell



Cranial nerves (contd)

B. Three Motor Nerves that supply extra-ocular muscles of eye:

3 rd	Occulomotor	Motor to extra-ocular muscles of eye	Contains Parasympathetic fibers
4 th	Trochlear	Supply one muscle of eye (superior oblique) (SO4)	<i>each C.N Supply only one muscle</i>
6 th	Abducent	Supply one muscle of eye (lateral rectus) (LR6)	



Cranial nerves (contd)

D. Two Motor Nerves: But Not extraocular supplier

11 th	Accessory	Has cranial & spinal parts.
12 th	Hypoglossal	Motor to muscles of tongue.

Cranial nerves (contd)

C. Four Mixed Nerves:

5 th	Trigeminal	<p>* <u>Largest cranial nerve.</u></p> <p>* Motor to muscles of mastication.</p> <p>* Sensory to face & teeth.</p>	<p>→ The most contain nerve fibers</p> <p>عاد العصب الذي يخرجه د. الأسنان</p>
7 th	Facial	<p>* Motor to muscles of face.</p> <p>* Contains sensory fibers.</p>	<p>Contains Parasympathetic fibers</p>
9 th	Glossopharyngeal	<p>* Motor to one muscle of pharynx. → <i>Stylopharyngeus m.</i></p> <p>* Sensory to pharynx & tongue.</p>	<p>Contains Parasympathetic fibers</p>
10 th	Vagus	<p>* <u>Longest cranial nerve.</u></p> <p>* Motor to organs in thorax & abdomen.</p>	<p>Contains Parasympathetic fibers</p>



+ 3rd C.N

طويل والدليل انه سرح

لبرا ووصل الصدر والبطن

To supply GIT ← → To supply heart & lungs

Cranial Nerve Names


Only One Of The Two Athletes Felt Very Good, Victorious, And Healthy

1. Only = **Olfactory**
2. One = **Optic**
3. Of = **Oculomotor**
4. The = **Trochlear**
5. Two = **Trigeminal**
6. Athletes = **Abducens**
7. Felt = **Facial**
8. Very = **Vestibulocochlear**
9. Good = **Glossopharyngeal**
10. Victorious = **Vagus**
11. And = **Accessory**
12. Healthy = **Hypoglossal**

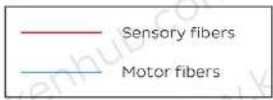
Cranial Nerve Functions

Some Say Marry Money, But My Brother Says Big Brains Matter Most

(S) = Sensory, (M) = Motor, (B) = Both

$3+7=10, 9$ 
= parasympathetic
fibers

1. Some = (S) Olfactory
2. Say = (S) Optic
3. Marry = (M) Oculomotor
4. Money = (M) Trochlear
5. But = (B) Trigeminal
6. My = (M) Abducens
7. Brother = (B) Facial
8. Says = (S) Vestibulocochlear
9. Big = (B) Glossopharyngeal
10. Brains = (B) Vagus
11. Matter = (M) Accessory
12. Most = (M) Hypoglossal



Optic (II)
Sensory: Eye

Olfactory (I)
Sensory: Nose

Oculomotor (III)
Motor: All eye muscles except those supplied by IV and VI

Trochlear (IV)
Motor: Superior oblique muscle 304

Abducens (VI)
Motor: Lateral rectus muscle LR6

Trigeminal (V)
Sensory: Face, sinuses, teeth, etc.
Motor: Muscles of mastication

Vestibulocochlear (VIII)
Sensory: Inner ear

Glossopharyngeal (IX)
Motor: Pharyngeal musculature
Sensory: Tongue, pharynx

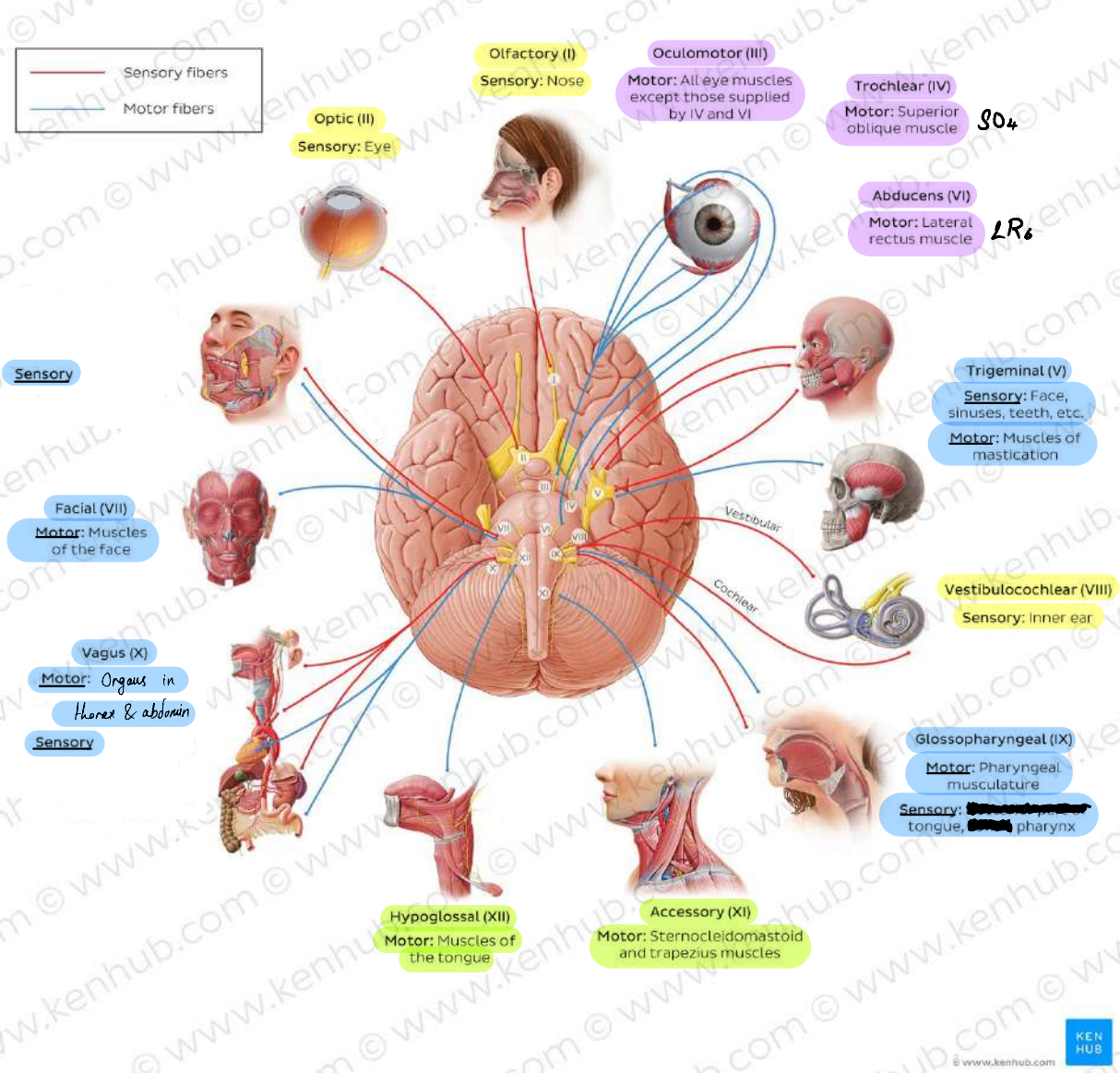
Hypoglossal (XII)
Motor: Muscles of the tongue

Accessory (XI)
Motor: Sternocleidomastoid and trapezius muscles

Sensory

Facial (VII)
Motor: Muscles of the face

Vagus (X)
Motor: Organs in thorax & abdomen
Sensory



Ventricular system

* They are cavities that lie within the brain. *In the cerebral hemispheres*

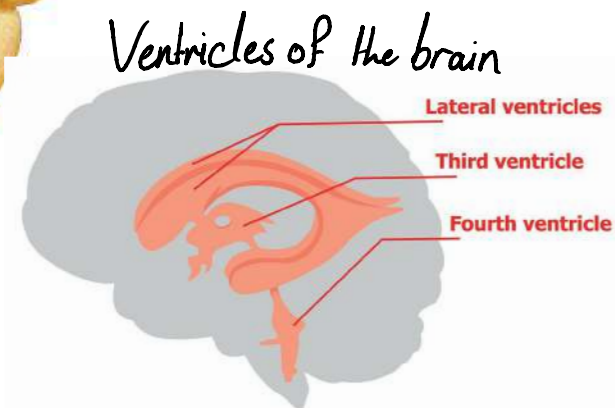
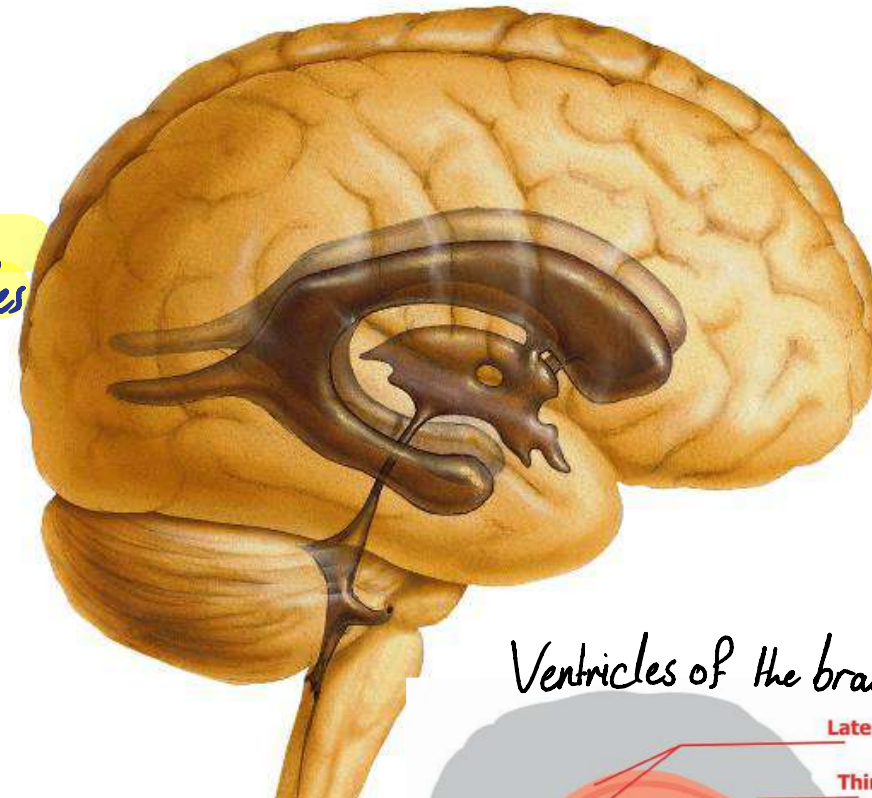
* They are filled with C.S.F.

A. Lateral ventricle: *Considered as 1st & 2nd ventricles*

* It is the cavity of cerebral hemisphere.

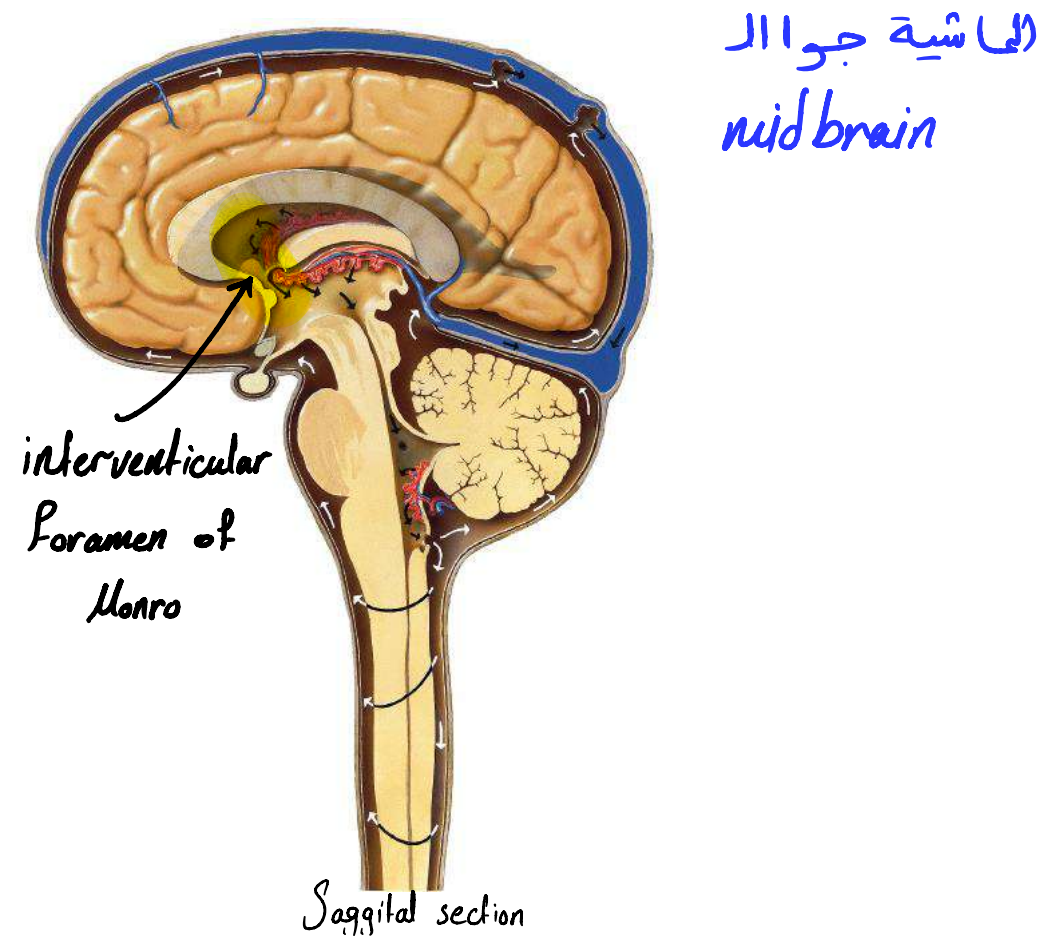
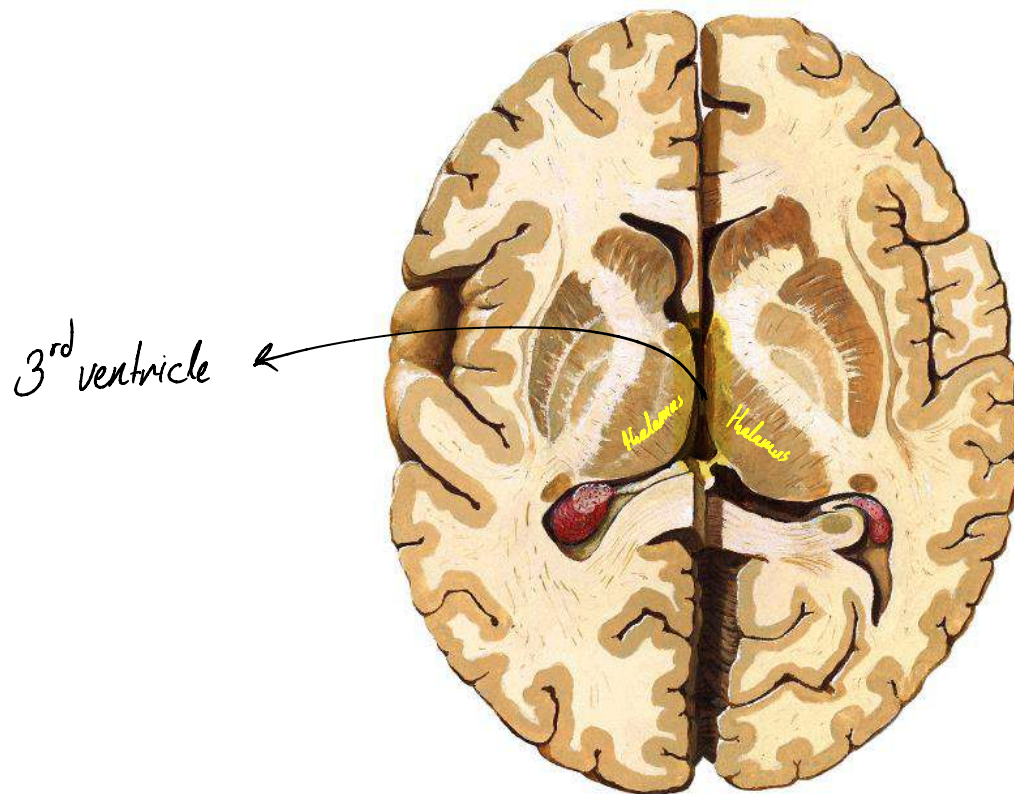
* It has *→ In frontal lobe* anterior horn, *→ In parietal lobe* body, *→ In occipital lobe* posterior horn and *→ in temporal lobe* inferior horn.

* It is connected to 3rd ventricle via inter-ventricular foramen of Monro.



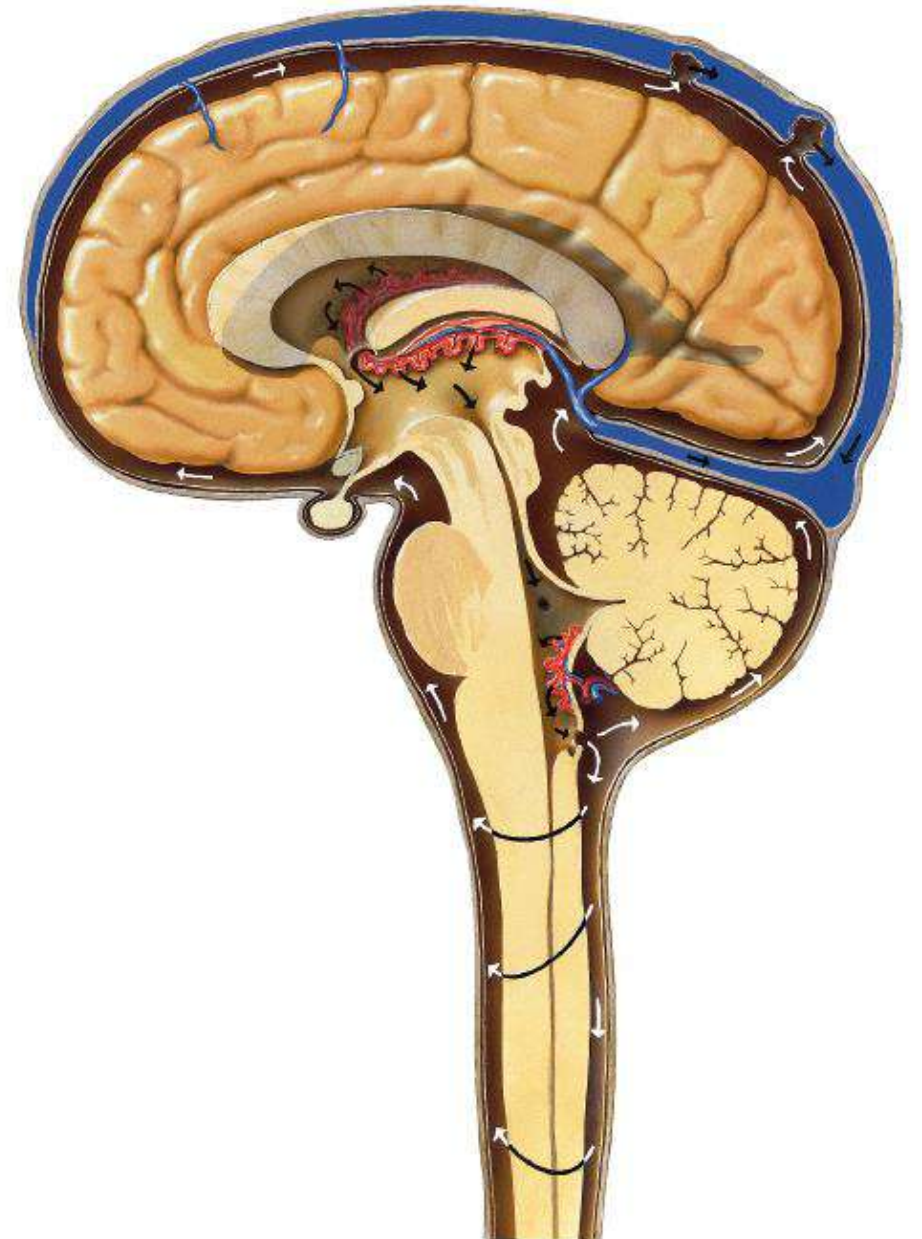
B. Third ventricle:

- * It is the cavity of diencephalon. (*The cavity between the 2 thalami*)
- * It is connected to lateral ventricle via inter-ventricular foramen and connected to 4th ventricle via cerebral aqueduct.



C. 4th Ventricle:

- * It lies between:**
- *** Cerebellum → posteriorly & pons & medulla → anteriorly.**
- * It is connected to 3rd ventricle by cerebral aqueduct and with central canal of medulla & spinal cord.**

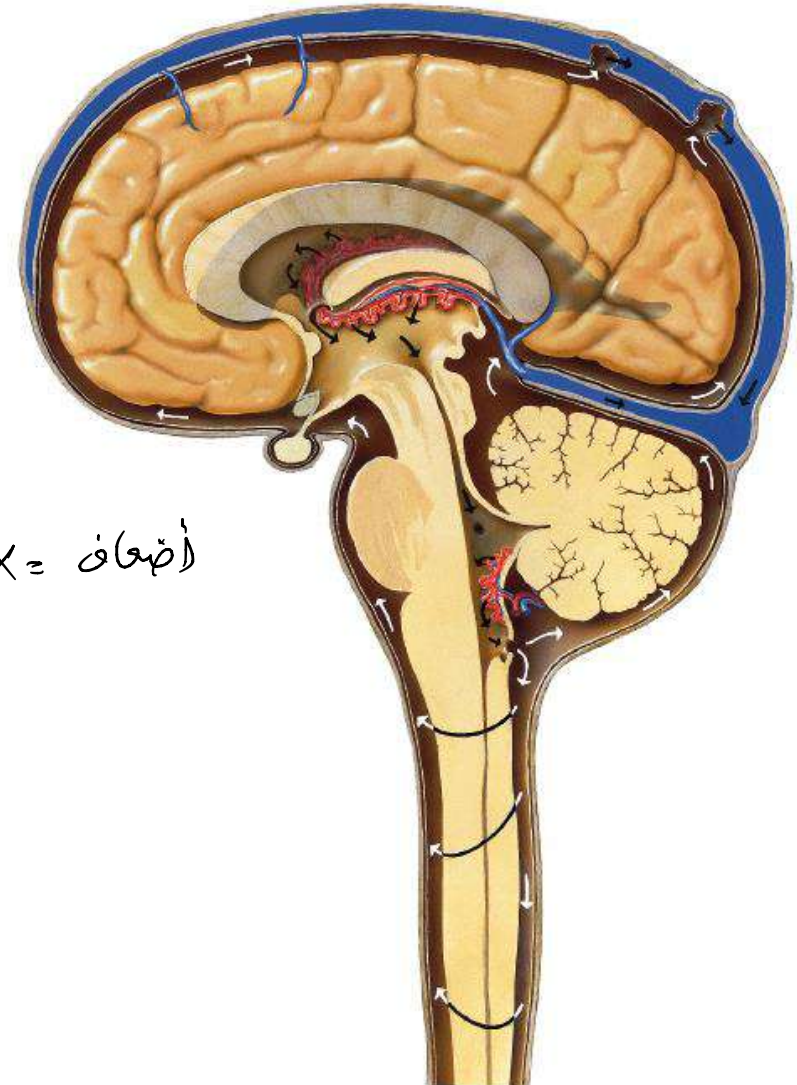


Cerebrospinal Fluid (C.S.F)

* It is a clear colorless fluid that lies within the ventricles and subarachnoid space. → داخل / حول الدماغ

* **Volume: 150 ml.** 3 or 4 X what we produce X = أضعاف

* **Formation: choroid plexus of lateral ventricle.** شبكة



* **Circulation:** CSF passes from lateral ventricle to third ventricle via inter-ventricular foramen and from third ventricle to 4th ventricle by cerebral aqueduct. It escapes from 3 foramina in 4th ventricle to subarachnoid space.

* **Absorption:** Arachnoid villi.

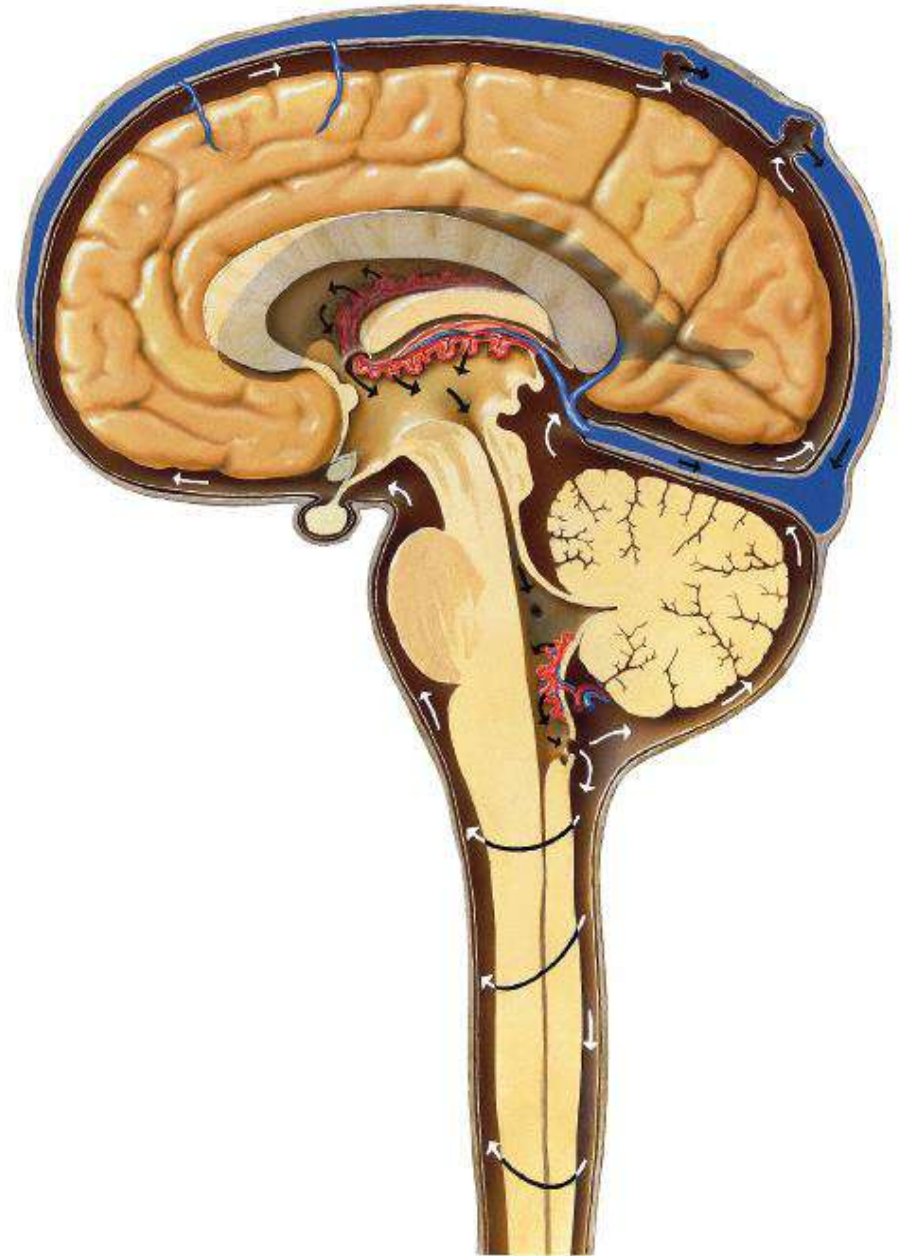
* **Function:**

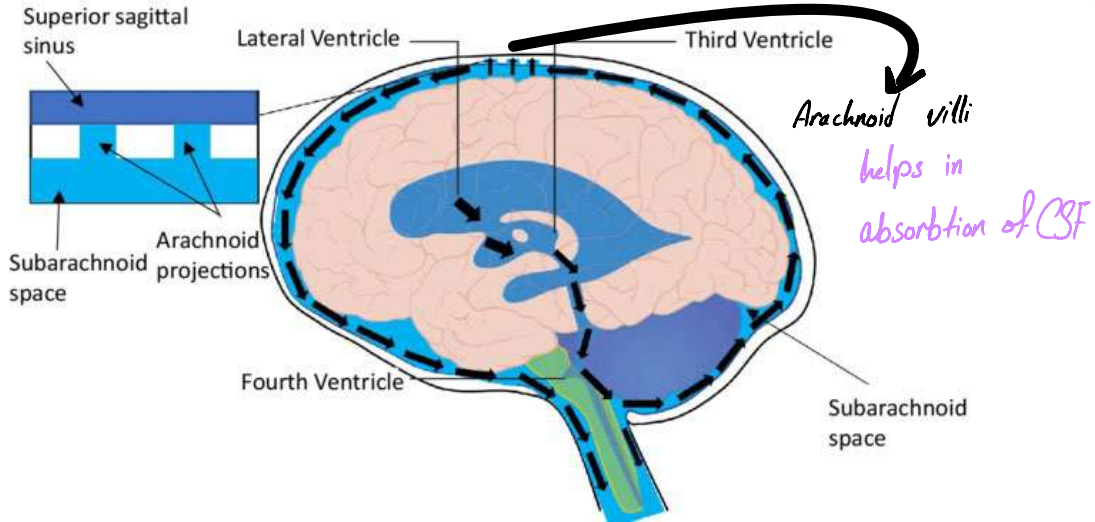
1. Protection of brain. *jacket* → *Shock absorber*

2. Removal of metabolites.

↳ Cuz there is no lymphatic fluid in CNS

* *تَجِدَرُ CSF يَوْمِيًّا (3-4) مَرَاتٍ*





Spinal cord :- 45 cm

Vertebral column :- 70 cm

II. SPINAL CORD

Practical exam : 29 May
just identify

Final exam : 6 Q embryo

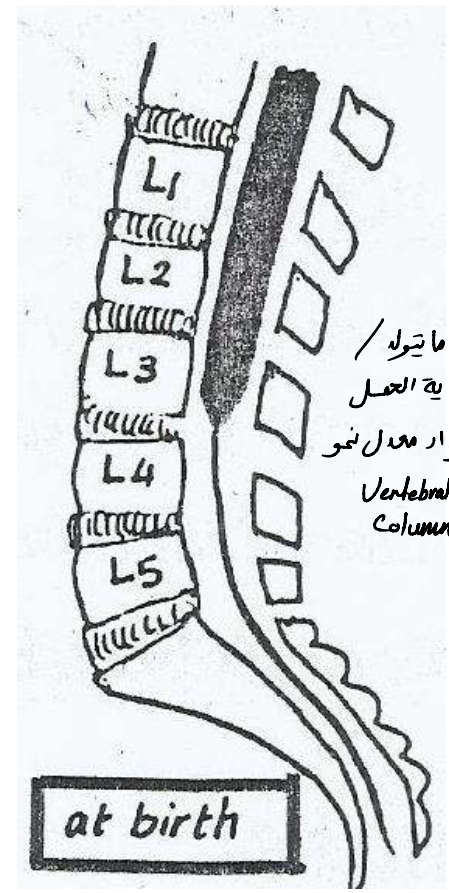
**** It is a part of C.N.S that lies within the vertebral canal.**

**** Begins: at foramen magnum as direct continuation of medulla.**

→ The end of medulla oblongata

**** Ends: at lower border of L1. in adults**

**** In children → it ends at upper border of L3 while in fetal life → the spinal cord and vertebral canal are equal in length. This variation is due to the differences in rate of growth of vertebral canal & spinal cord.**

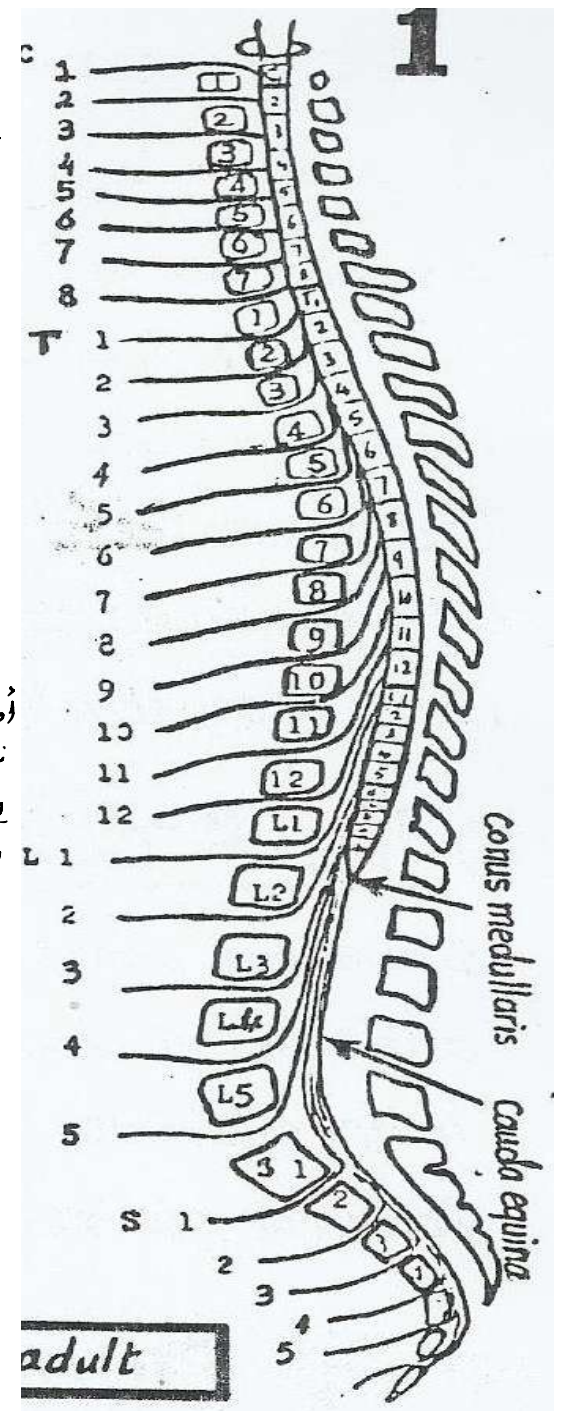


أول ما يتولد /
نهاية العنق
يزداد معدل نمو
ال Vertebral
Column

مع الوقت يبقى معدل نمو

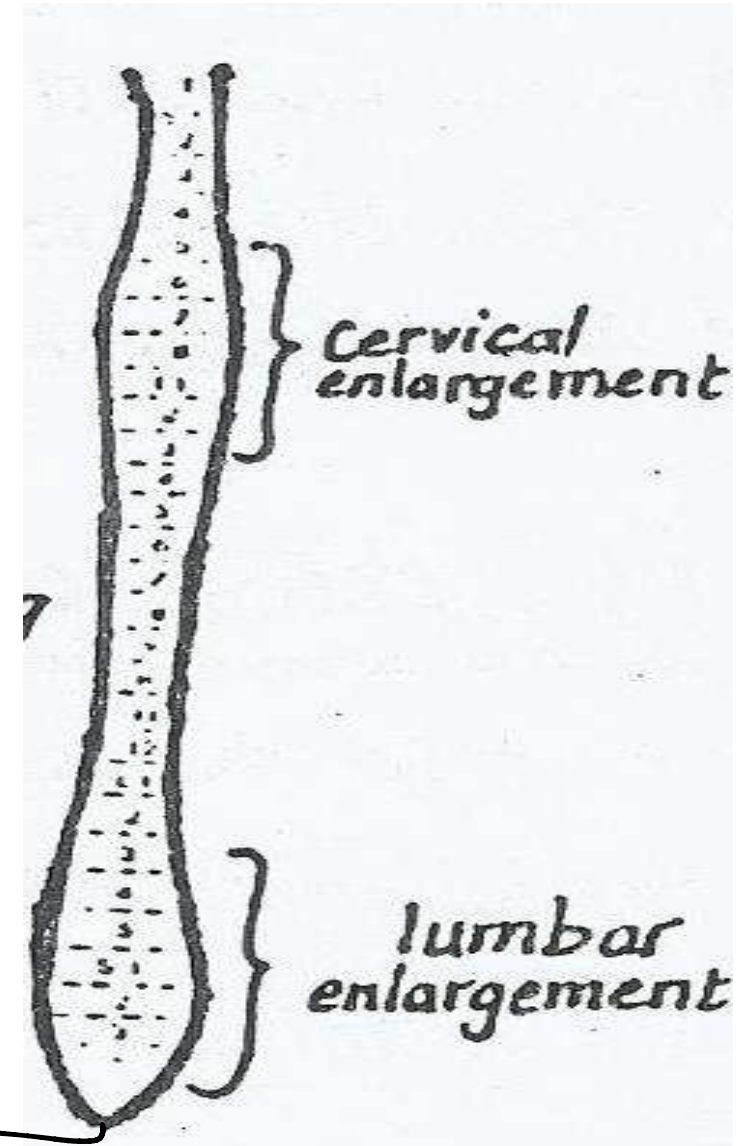
V.C > S.C

ال V.C أكبر من معدل نمو ال spinal cord



II. SPINAL CORD (Contd)

** **Shape:** cylindrical in shape, but it shows 2 enlargements; ^①cervical and ^②lumbar enlargements which are the source of nerve supply to upper & lower limbs respectively. The lower end is tapering and is called **conus medullaris**.



مدبب

مضروطي

Conus medullaris ←

* Length: 45 cms.

* Spinal cord coverings: It has 3 coverings: **dura, arachnoid & pia matter.**

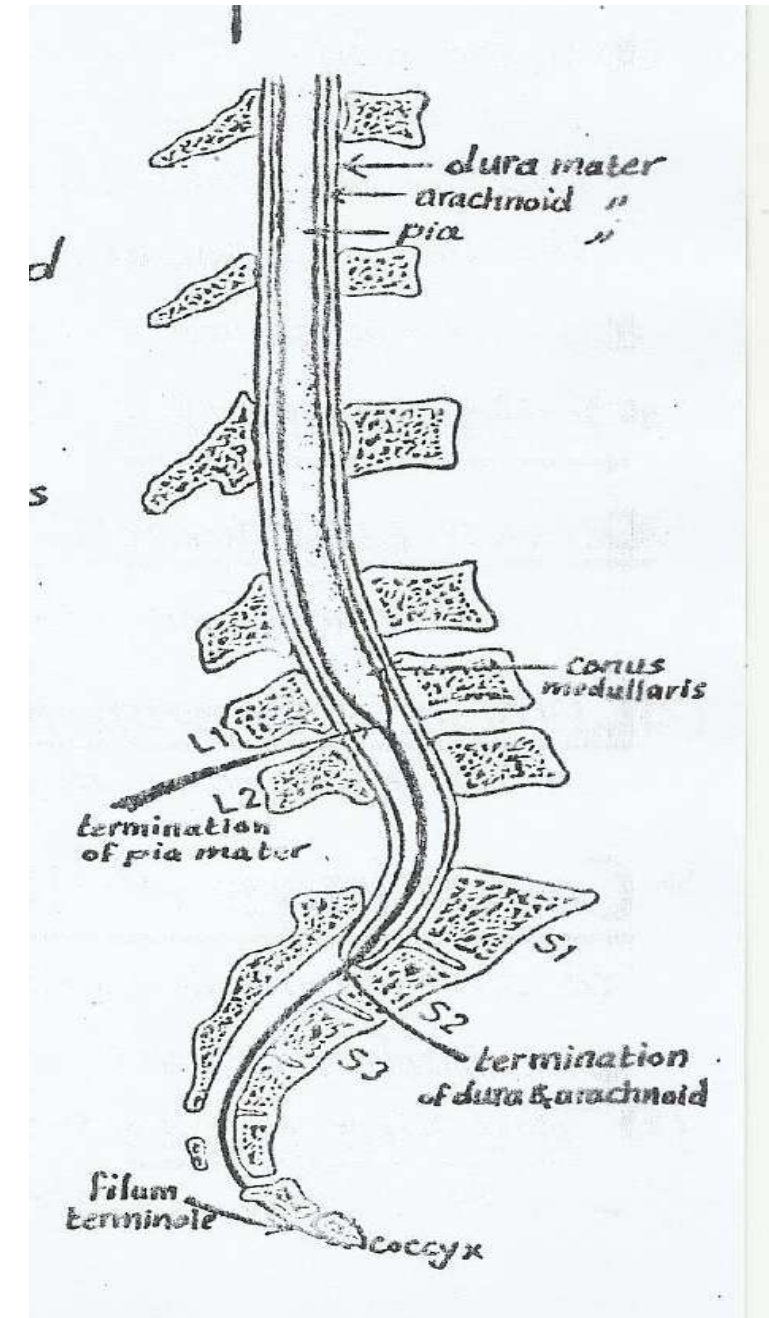
بغض مع ال S.C
بس بطلع منه زي
Thread

* **Dura and arachnoid ends at S2.**

* Pia matter forms a **prolongation called filum terminale** which extends from **apex of conus medullaris** to be **attached to the back of coccyx.**

كوسيلة لتثبيت
the Spinal cord

* C.S.F lies in the subarachnoid space.



**** Spinal nerves:**

* 31 pairs of spinal nerve are attached to the spinal cord, (8 cervical, 12 thoracic, 5 lumbar, 5 sacral and one coccygeal).

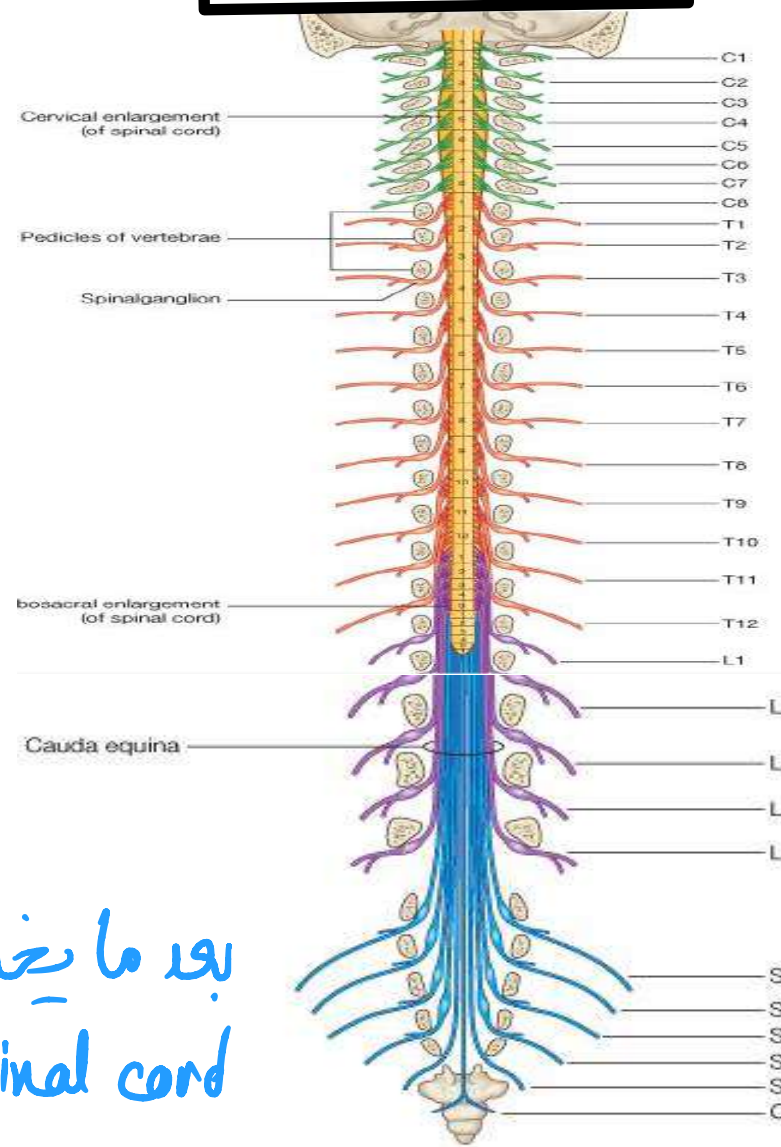


ذيل الحصان

* Cauda equina: formed by lower lumbar, sacral and coccygeal nerves that descend in the vertebral canal below level of L1.

بعد ما يخرج ال
Spinal cord

31 pairs of S.Ns
12 pairs of C.Ns



Structure of spinal cord

** It is formed of an inner core of grey matter surrounded by an outer white matter.

* Brain عكس ال *

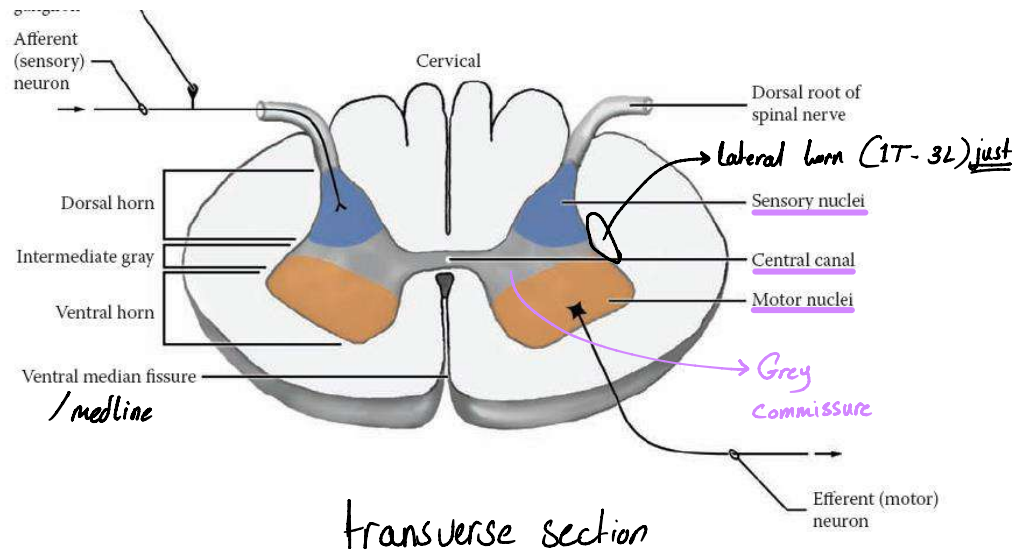
** The grey matter: is H shaped with an anterior (ventral) horn containing motor nuclei and posterior (dorsal) horn containing sensory nuclei. Both horns are joined by a thin grey commissure which is traversed by a central canal.

PGSF
يُسمى Thoracolumbar
لأنهم يستقر من

** A small lateral horn is present only in thoracic and upper 3 lumbar segments. It contains sympathetic nucleus and is considered the only source of preganglionic sympathetic fibers in the whole body.

type لأنه يطلع منهم / بعضي origin له

Anterior / ventral ⇒ Motor nuclei
Posterior / dorsal ⇒ Sensory nuclei



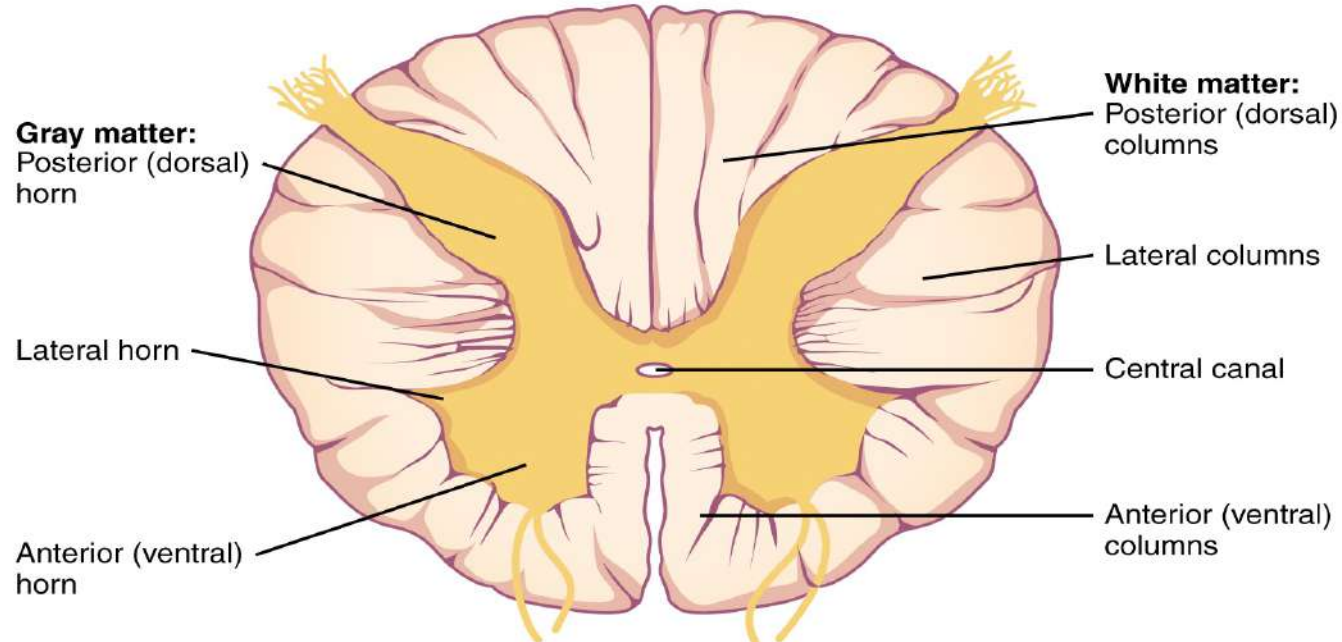
preganglionic sympathetic fibers
التي تحتوي على Sympathetic nucleus
وال lateral horn هي المكان الذي يطلع منه صدور ال Fibers عشان
تروع تغذي كل ما يحتاجه الجسم من sympathetic fibers

* Fibers from CNS to the ganglion
- Preganglionic fibers
& - Postganglionic fibers
sympathetic Thoraco lumbar

معلومة
من ال
physio

b. **White matter** is divided into:

- i. **Anterior white column:** between mid line and exit of ventral root of spinal nerves.
- ii. **Lateral white column:** lies between exist of ventral and dorsal roots of spinal nerves.
- iii. **Posterior white column:** lies between the dorsal root of spinal nerves and mid line.



Structure of spinal nerve

** Each spinal nerve is attached to the cord by 2 roots:

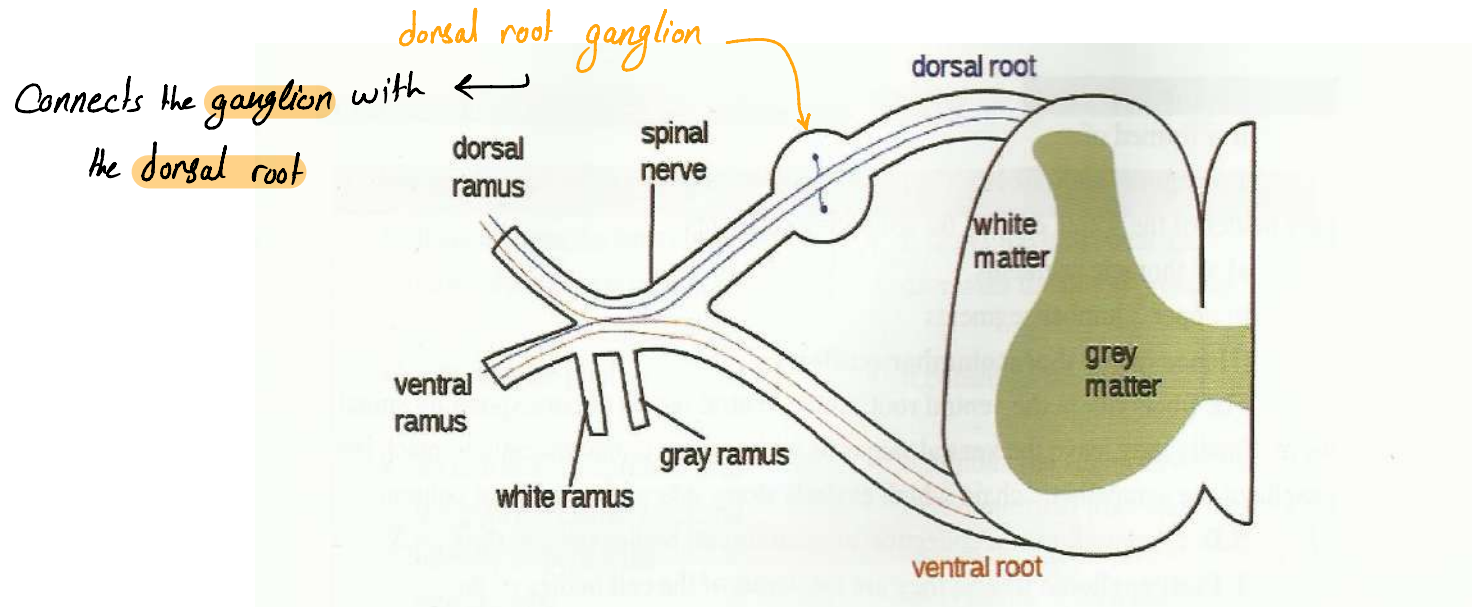
1. **Ventral root:** it is formed of motor fibres which carry impulses away from spinal cord. It is the axons of motor nuclei present in anterior (ventral) horn.

خارجة بال Motor orders للعضلات

تجمعات من الـ
nerve cells

2. **Dorsal root:** It is formed of sensory fibers which carry impulses to the spinal cord. It is the axons of cells of dorsal root ganglia present on dorsal roots.

داخل بال Sensations



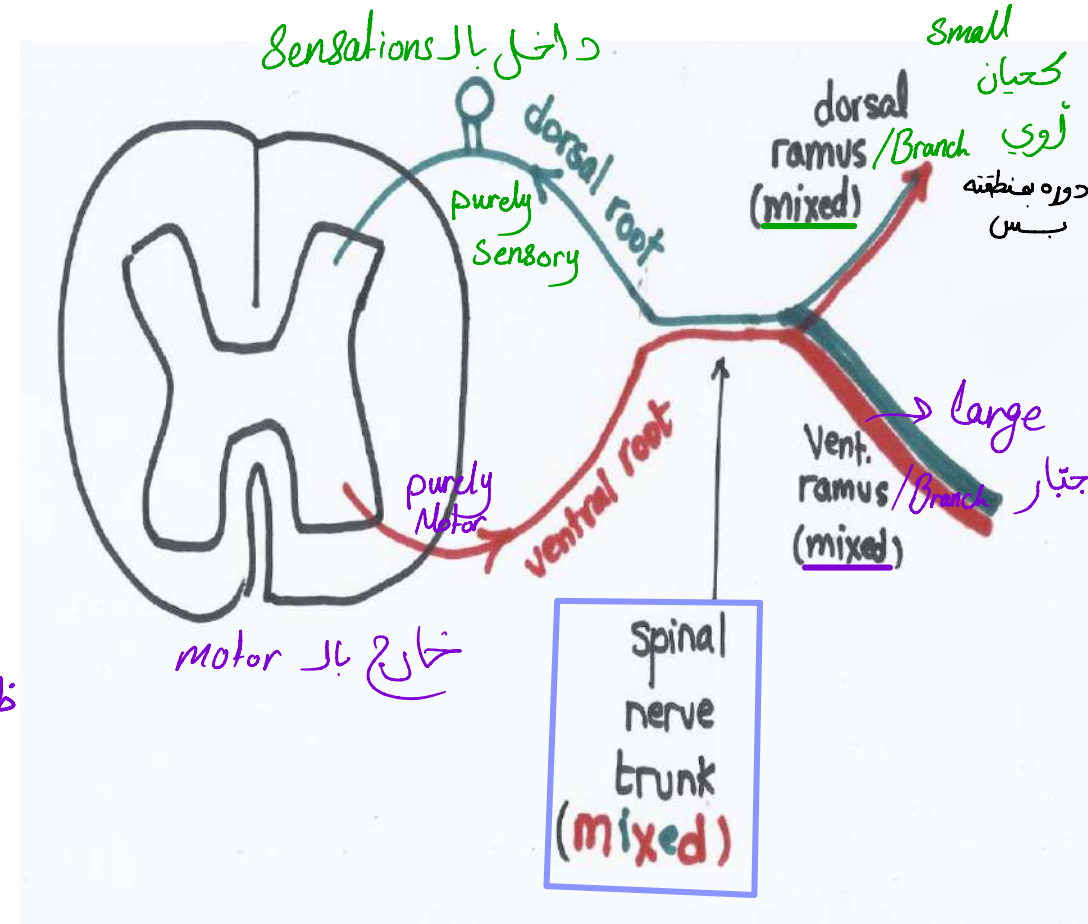
* Union of dorsal & ventral roots forms the spinal nerve which is mixed; it is very short and exits form the vertebral canal via the intervertebral foramina .

* The spinal nerve divides into large ventral ramus (mixed) & small dorsal ramus (mixed).

* **Ventral rami:** supply skin & muscles of anterolateral region of trunk and limbs.

Ventral rami tend to form plexuses (cervical – brachial – lumbar & sacral).

* **Dorsal rami:** supply the skin & muscles of back of the neck and trunk.



منطقة تقابلهم

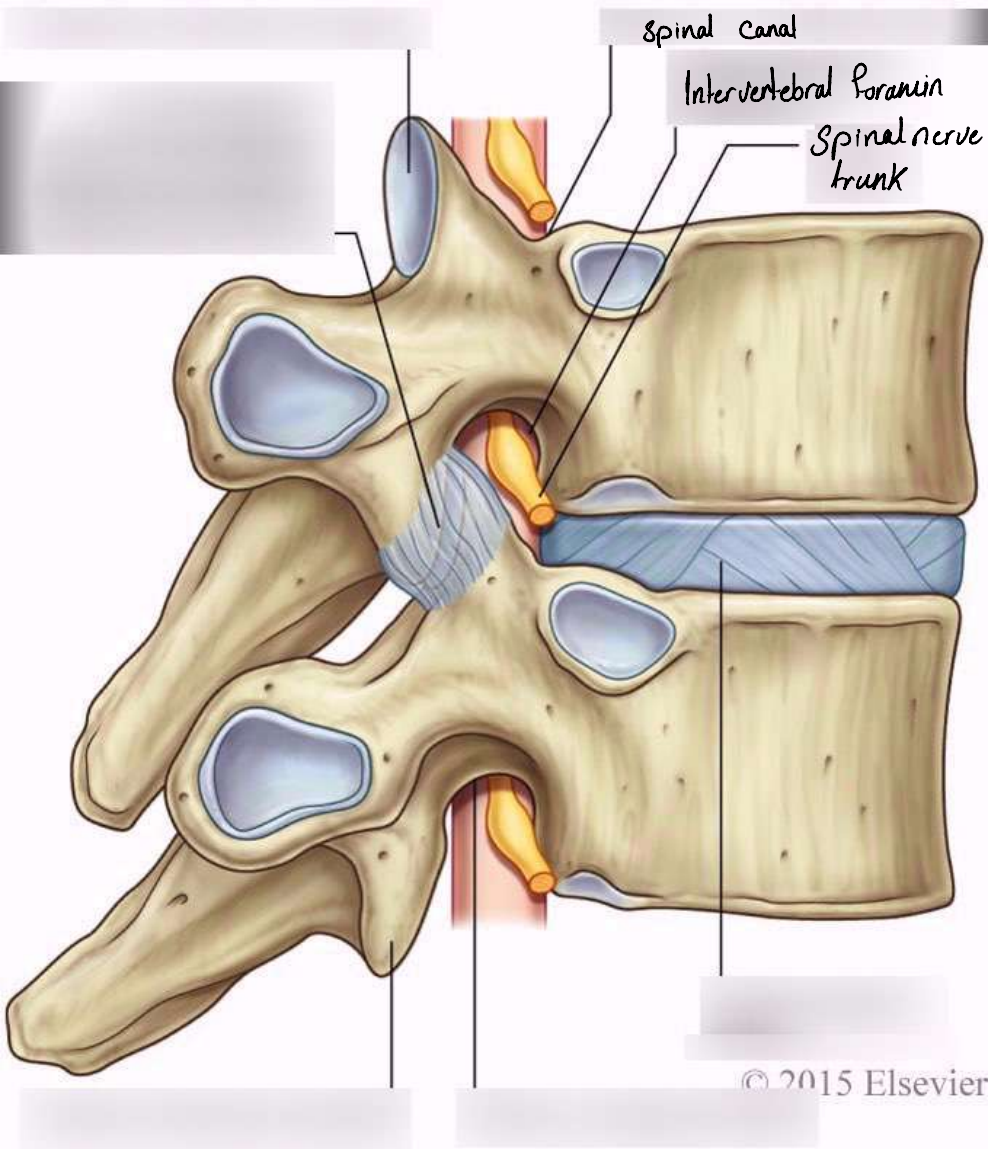


Fig. 2-12. Intervertebral foramina.

THANK
YOU

Done by :-

Jana Salah