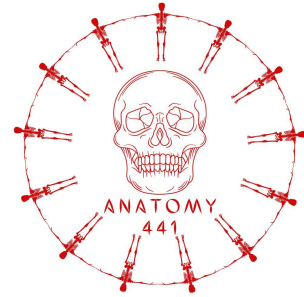


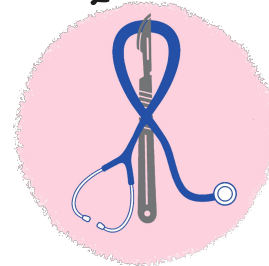
## Lecture 3:



# Nervous System

- Main text
- Red : Important
- Pink : in girls slides only
- Blue : in boys slides only
- Green : Doctors Notes
- Grey : Extra info

Revised & Reviewed  
by:  
Abdulaziz & Bahammam  
Faye Wael Sendi



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# Objectives :

**At the end of the lecture , students should be able to:**

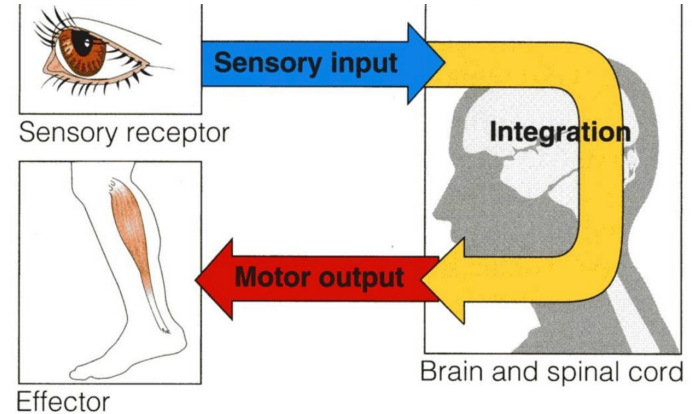
- List the subdivisions of the nervous system
- Define the terms : **grey matter , white matter , nucleus , ganglion , tract** and **nerve** .
- List the parts of the brain .
- Identify the external and internal features of spinal cord .
- Enumerate the cranial nerves .
- Describe the parts and distribution of the spinal nerve .
- Define the term '**dermatome**'.
- List the structure protecting the central nervous system.

# Functions of nervous system

**1- collection of sensory input :** (**PNS**) Identifies change occurring inside and outside the body by using sensory receptors (these changes are called **stimuli**).

**2- Integration :** (**CNS**) processes, analyses and interprets these changes And make decisions.

**3- Effects a response:** (**PNS**) by activating muscles or glands via **motor output**.

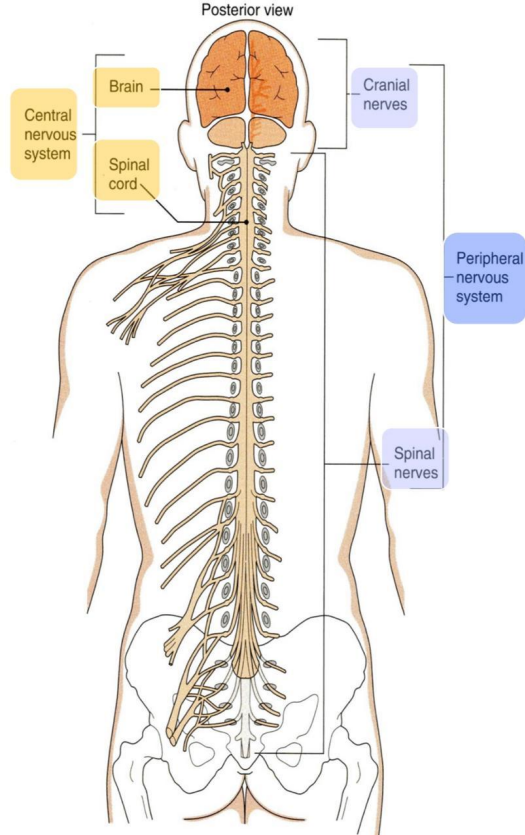


# Structural organization

## Central Nervous System (CNS)

Brain

Spinal cord



## Peripheral Nervous System

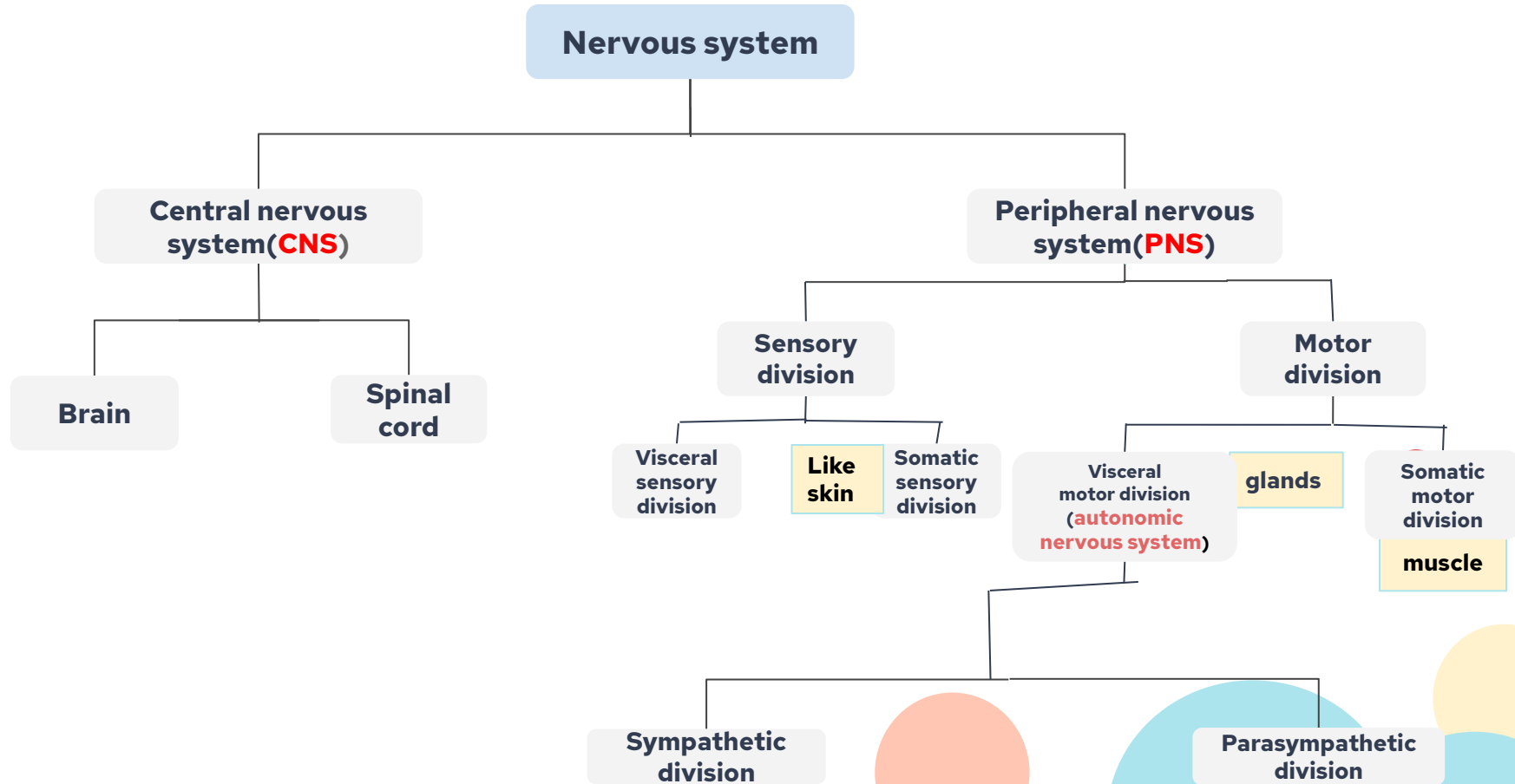
Nerves

Ganglia

cranial

spinal

# Functional organization

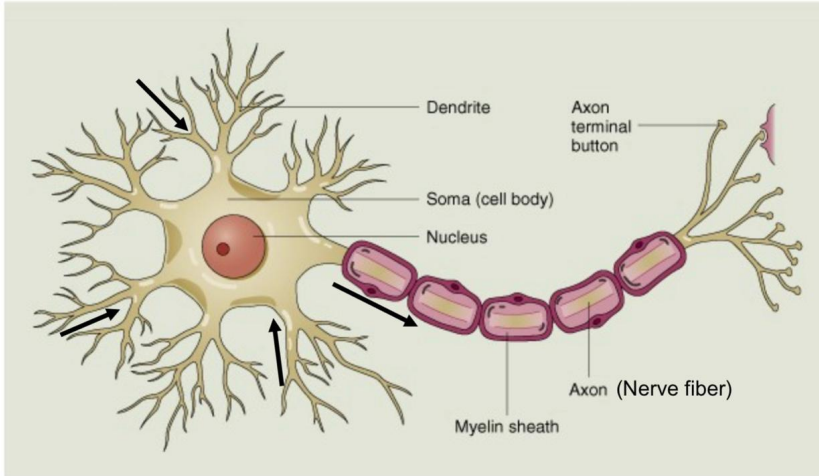


# Nervous Tissue

## Nervous tissue consists of:

1- Nerve cells(**neurons**)

2- Supporting cells(**neuroglia**)

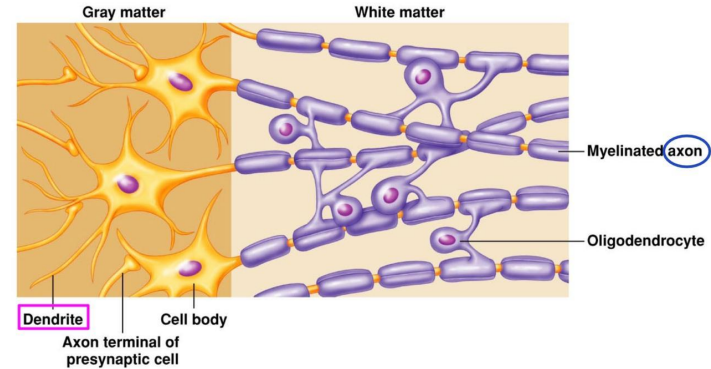


A typical multipolar neuron

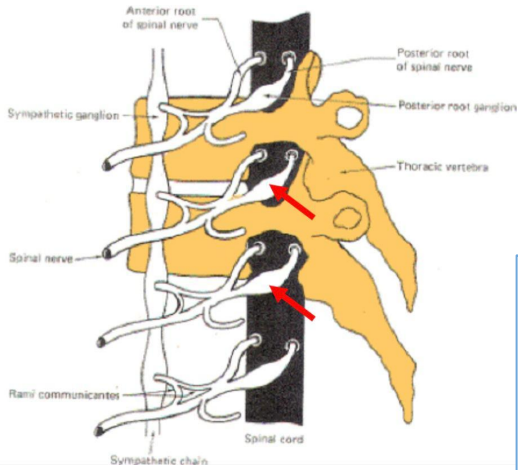
© 2000 John Wiley & Sons, Inc.

## Nervous tissue is organized as:

| Gray matter                                  | White matter                             |
|--|--|
| <b>Contain</b> cell bodies                   | <b>No</b> cell bodies                    |
| Short processes of the neurons<br>(Dendrite) | Long processes of the neurons<br>(Axons) |
| <b>Neuroglia</b>                             |  |
| <b>Blood vessels</b>                         |  |

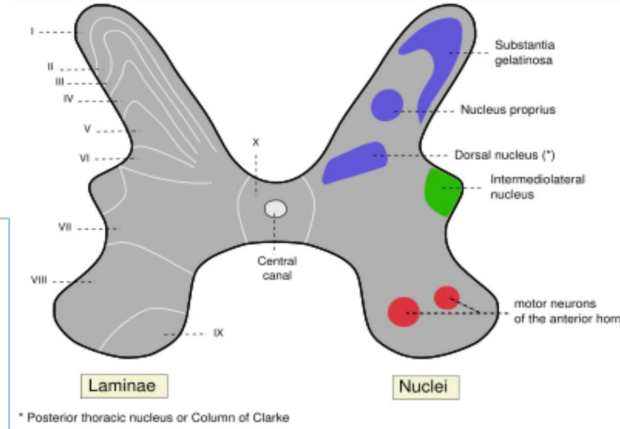


# Remember



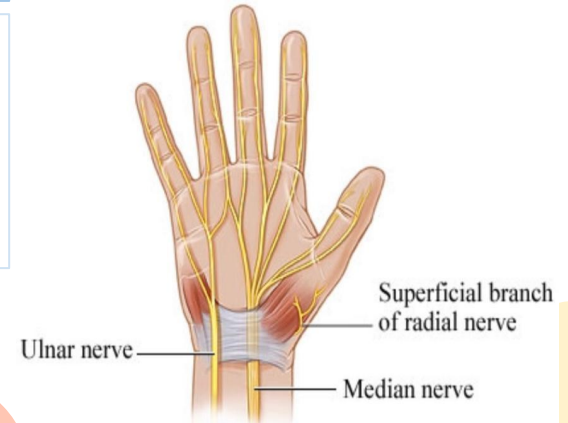
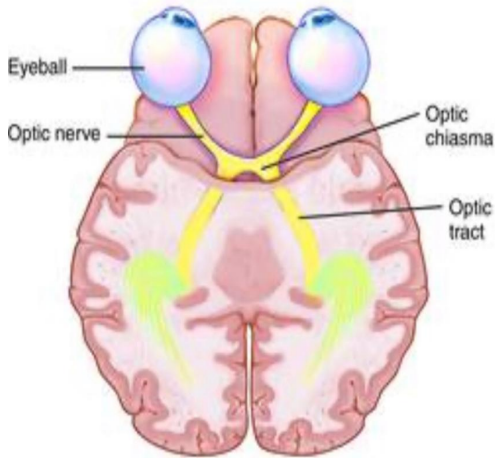
A group of neurons outside the CNS is called a **ganglia**

A group of neurons within the CNS is called a **nuclei**



A group of nerve fiber(axons) Within the CNS is called a **tract**

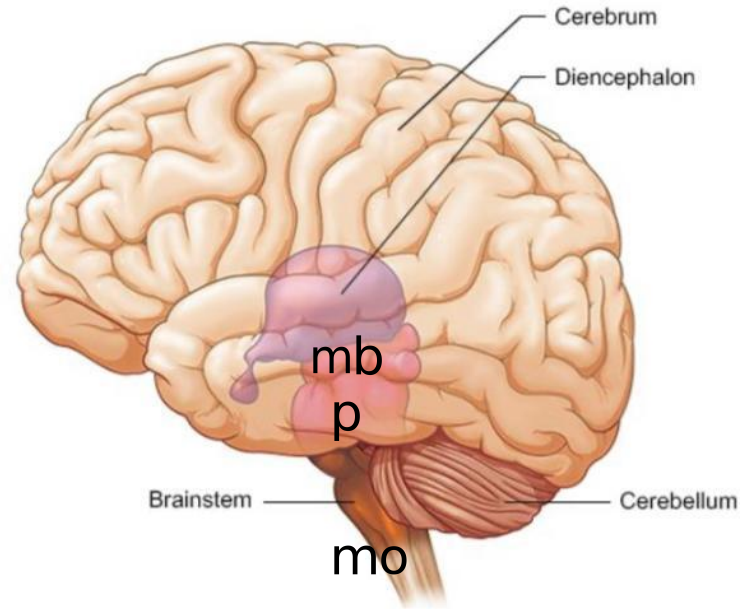
A group of nerve fibers(axons) Outside the CNS is called **nerve**



# The Brain

The brain is a large mass of nervous tissue located in the cranial cavity. It has four major regions:

1. **Cerebrum**(المخ):
  - 2 Cerebral hemispheres
2. **Cerebellum**(المخيخ)
3. **Diencephalon**(الدماغ البيني):
  - Thalamus
  - Hypothalamus
  - Subthalamus
  - Epithalamus
4. **Brainstem** (جذع الدماغ):
  - Midbrain
  - Pons
  - Medulla Oblongata





# Cerebrum

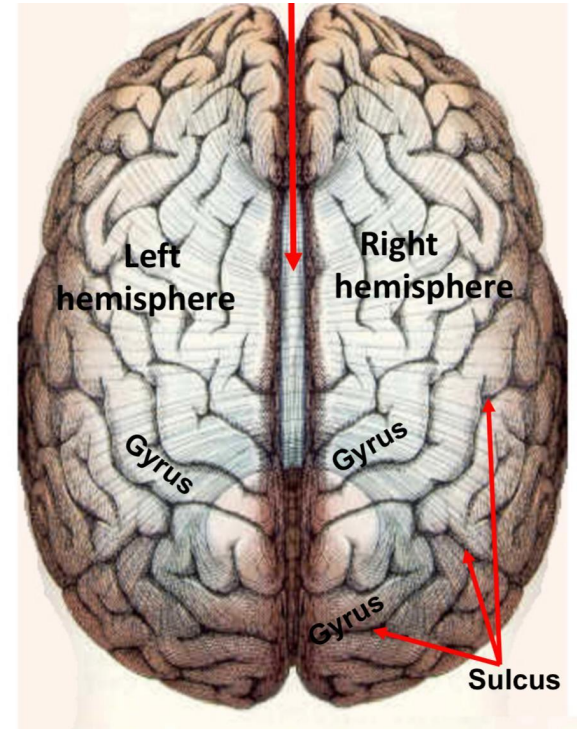
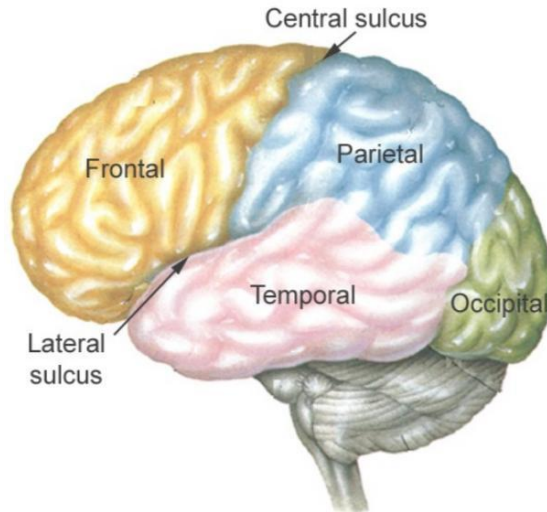
The largest part of the brain, has **two hemispheres**.

The cerebral hemispheres are connected by a thick bundle of nerve fibers called **corpus callosum**.

The surface shows ridges of tissue, called **gyri**, separated by grooves called **sulci**.

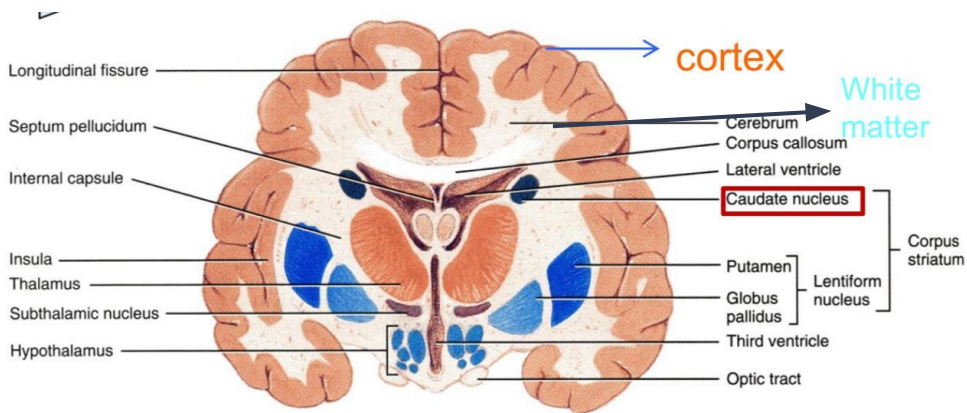
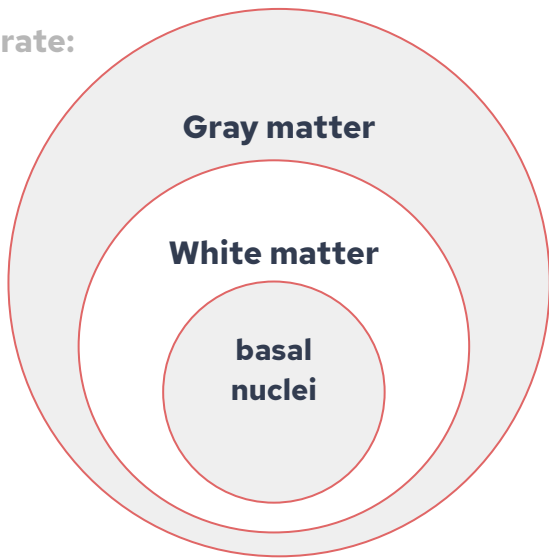
Cerebrum divided by deeper **sulci**, into **4 lobes** (each hemisphere):

- **frontal**
- **parietal**
- **temporal**
- **occipital**



# Tissue of Cerebral Hemispheres

To illustrate:



(b) Anterior view of frontal section

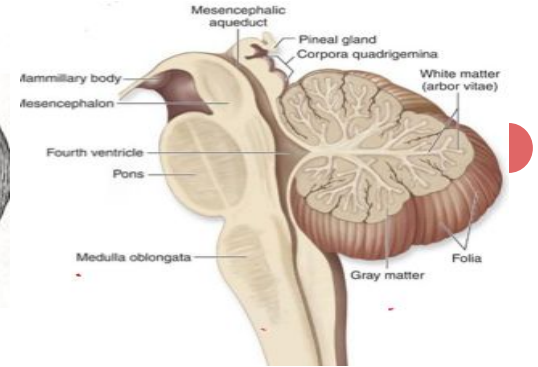
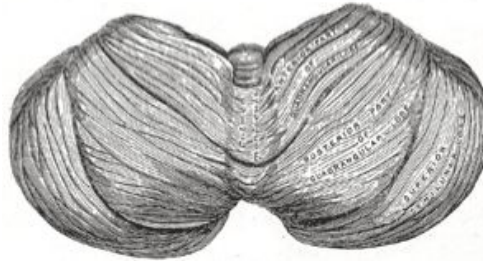
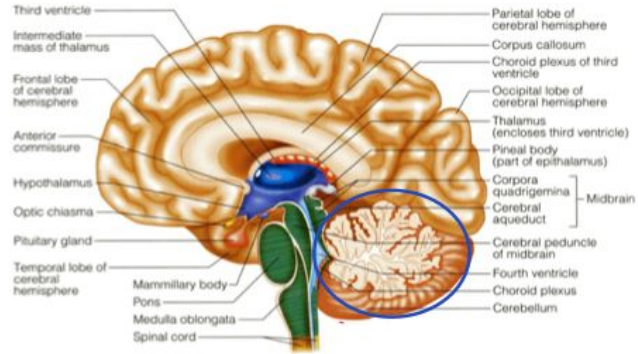
- The outermost layer is called **gray matter** or **cortex**
- Deeper is located the **white matter**, composed of fiber tracts (bundles of nerve fibers), carrying impulses to and from the cortex
- Located deep within the white matter are masses of grey matter called the **basal nuclei**. They help the motor cortex in the regulation of **voluntary motor activities**

# Cerebellum

The cerebellum has **2 hemispheres** and a convoluted surface.

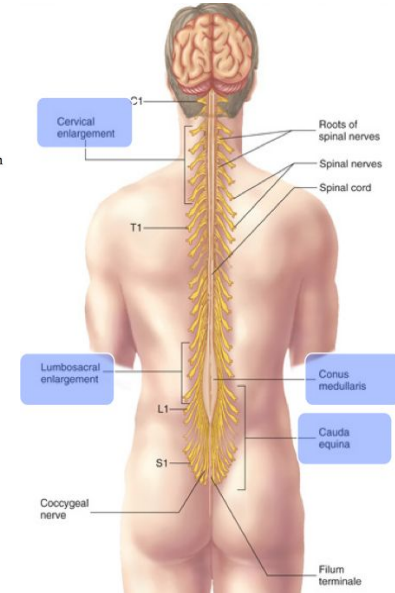
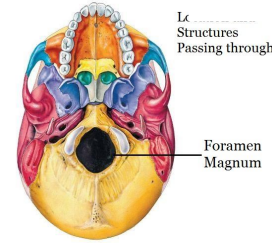
It has an outer cortex of **gray matter** and an inner region of **white matter**.

**Function:** It provides precise coordination for body movements and helps to **maintain equilibrium**.



# Spinal cord

- It is a two-way conduction pathway to the brain & a major reflex center .
- **42-45 cm** long, cylindrical in shape, lies within the **vertebral canal**.
- Extends from **foramen magnum** to **L2** vertebra.
- Continuous above with **medulla oblongata**.
- Caudal tapering end is called **conus medullaris**. (تشبه ال Cone حق الايسكريم)
- Has 2 enlargements : **cervical** (عشان عضلات اليد) and **lumbosacral** (عشان عضلات القدم) .
- Gives rise to 31 pairs of **spinal nerves** .
- Group of spinal nerves at the end of spinal cord is called **cauda equina** (يشبه ذيل الحصان).



# Cross section of spinal cord

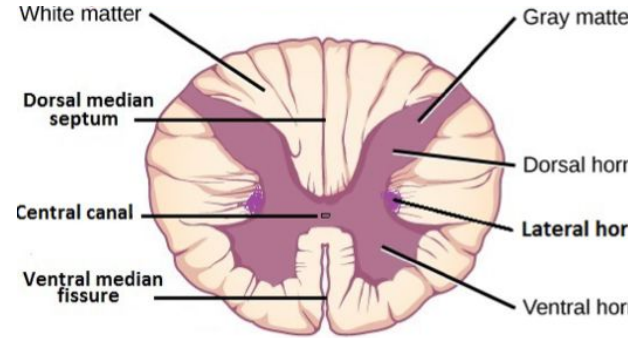
The spinal cord is incompletely divided into two equal part :

- **Anteriorly** by a short, shallow **median fissure**
- **posteriorly** by a deep narrow **median septum** .

It is composed of grey matter in the centre surrounded by white matter .  
( cerebrum & cerebellum عكس )

The arrangement of grey matter resembles the shape of the letter H, having two posterior, two anterior and two lateral horns/columns. (the lateral horn is not found in all of the spinal cord)

تذكروا شكل الفقرات بما انها عظام هي من يرا بيضاء



# Protection of the CNS

The CNS is protected by :

Bones: skull & the vertebral column

Meninges: 3 layers

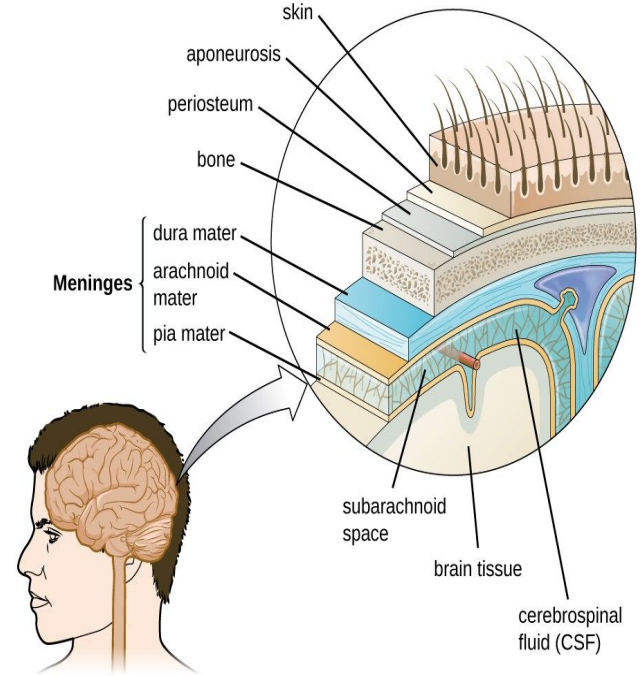
Cerebrospinal fluid:  
In the subarachnoid space  
between arachnoid and pia mater

Dura mater  
(outermost)  
(Thick)

Arachnoid mater  
(middle)

Pia mater  
(innermost)

Arachnoid means Spider \*just to memorize



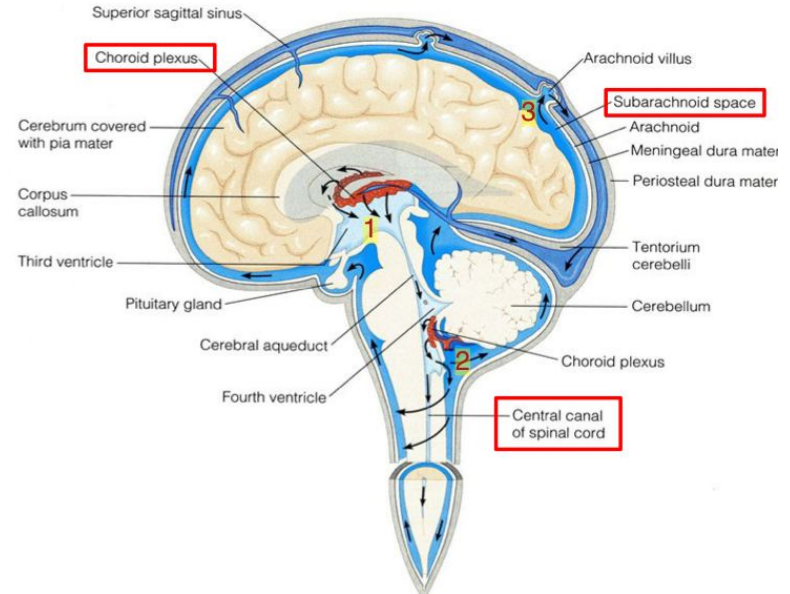
Helpful video

# Cerebrospinal Fluid (CSF)

1- CSF is produced by the **choroid plexuses** inside the ventricles of brain

2- Most of the CSF drains from the ventricles into the **subarachnoid space** around the brain and spinal cord. A little amount flows down in the **central canal** of the spinal cord.

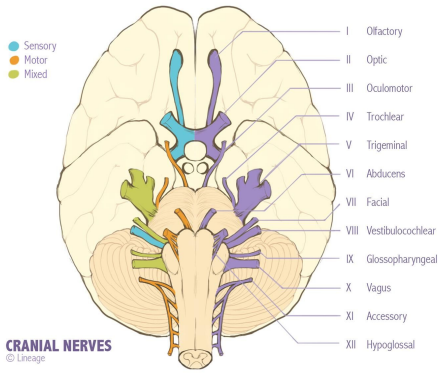
3- CSF is constantly **drained** into the **dural sinuses** through the **arachnoid villi**.



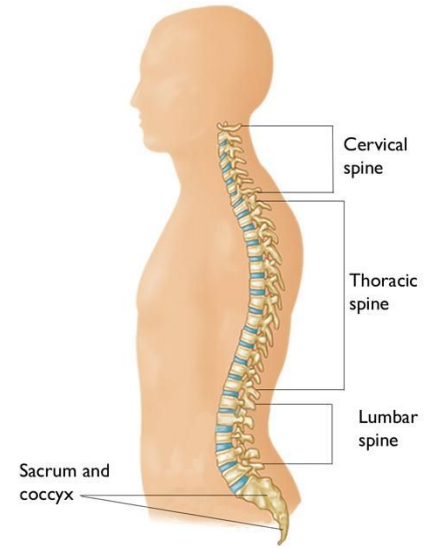
# Peripheral nerves

May be **sensory**, **motor** or **mixed**.

Two types:



| Cranial :                             | Spinal :   |
|---------------------------------------|--|
| <b>12 pairs</b>                       | <b>31 pairs</b>  |
| <b>Attached to brain</b>              | <b>Attached to spinal cord</b>                                       |
| <b>Named &amp; numbered from 1-12</b> | <b>Named and numbered according to the region of the spinal cord</b> |





# Cranial nerves

12 pairs :

**4 pairs are mixed :**

**Trigeminal n.(5th)**

**Facial n.(7th)**

**Glossopharyngeal n.(9th)**

**Vagus n.(10th)**

**5 pairs are motor :**

**Oculomotor n.(3rd)**

**Trochlear n.(4th)**

**Abducent n.(6th)**

**Accessory n.(11th)**

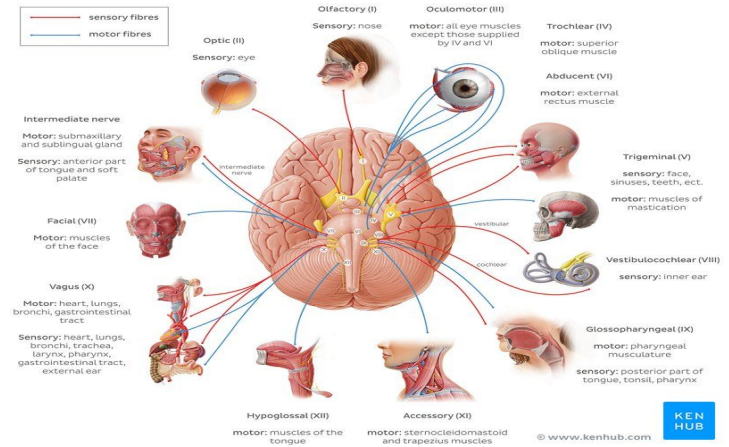
**Hypoglossal n.(12th)**

**3 pairs are sensory :**

**Olfactory n.(1st)**

**Optic n.(2nd)**

**Vestibulocochlear n.(8th)**



## CRANIAL NERVES MNEMONICS :

S-SENSORY , B-BOTH , M-MOTOR

SOME SAYS MONEY MATTERS BUT MY BROTHER SAYS  
BIG BRAIN MATTERS MOST

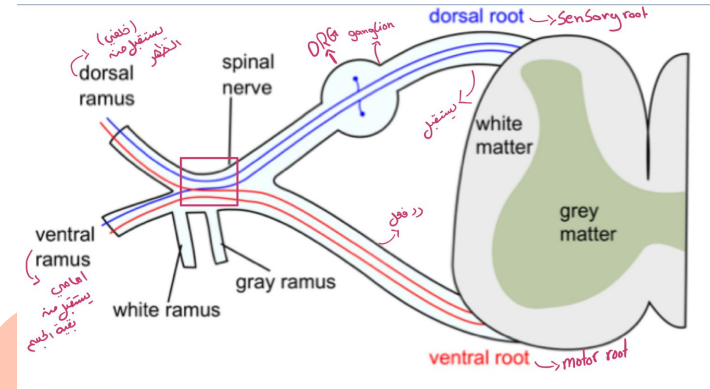
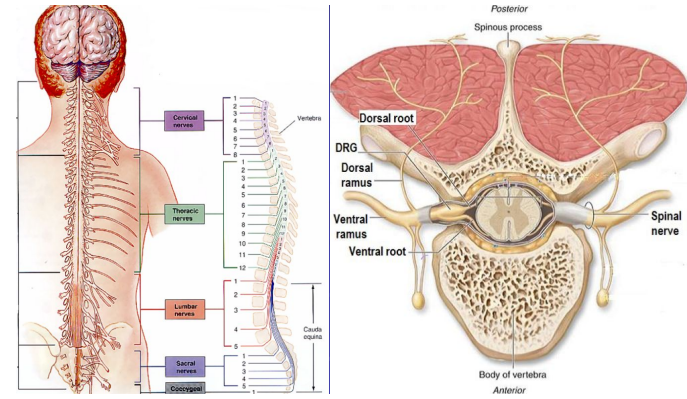
THE PAIRS:

ON OCCASION OUR TRUSTY TRUCK ACTS FUNNY VERY  
GOOD VEHICLE ANY HOW

# Spinal nerves and nerve plexuses

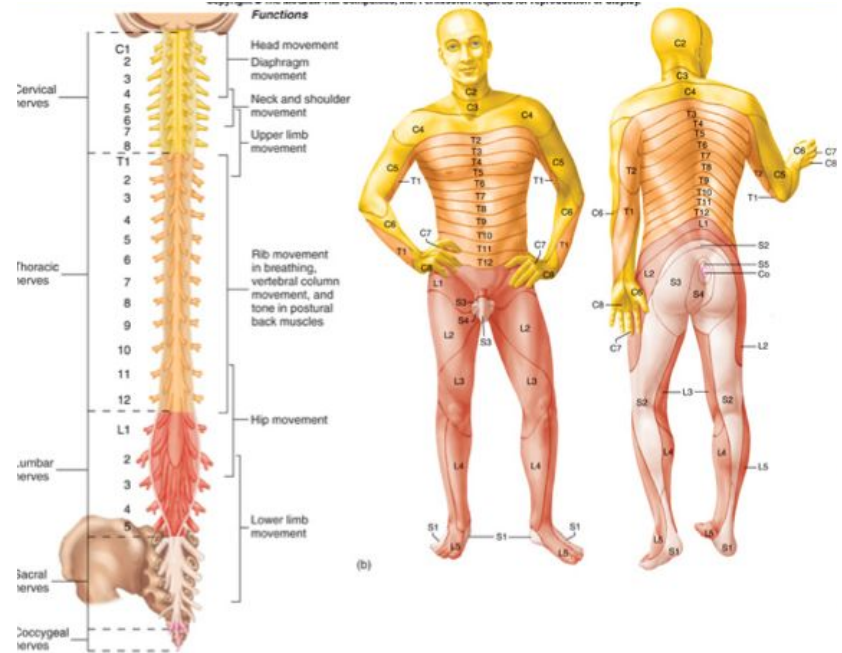
**31 pairs** each spinal nerve is attached by two roots : **dorsal (Sensory)** & **ventral (motor)**

- Dorsal root bears a **sensory ganglion (DRG)**
- Each spinal nerve exits from the **intervertebral foramen** and divides into a **dorsal** and **ventral ramus**.
- The rami contain both sensory and motor fibers
- The **dorsal rami** are distributed individually, supply the skin and muscles of the back .
- The **ventral rami** form plexuses (ظفيرة) (except in thoracic region where they form the **intercostal nerves**), and supply the **anterior** part of the body .



# Dermatomes

The segment of skin supplied by a **segmental spinal nerve** is called a **“dermatome”**.



## MCQs:

1-Central Nervous System(CNS) consist of

A-brain and spinal cord

B-spleen and nerves

C- somatic neuron and spleen

D-none of the above

2-Which part of the brain connected by corpus callosum

A-cerebellum

B-cerebrum

C-brainstem

D-spinal cord

3-It provides precise coordination for body movements and helps to maintain equilibrium.

A-cerebrum

B-brainstem

C-cerebellum

D-diencephalon

4- which one of these forms plexuses ?

A- dorsal root

B- ventral root

C- dorsal ramus

D- ventral ramus

5- which one of these is 1- sensory 2-motor ?

A- 1-dorsal root  
2- ventral root

B- 1- ventral root  
2- dorsal root

C- 1- dorsal ramus  
2- ventral ramus

D- 1-ventral ramus  
2- dorsal ramus

## Answers

1

A

2

B

3

C

4

D

5

A

## Team members:

|                  |                   |                 |              |
|------------------|-------------------|-----------------|--------------|
| عبدالإله آل رشود | عبدالعزيز عناب    | فاطمة البن موسى | غادة الحربي  |
| راكان العبيد     | عبدالرحمن الهميلي | سحر الحكمي      | ريما الرشيدى |
| يحيى الغامدي     | محمد العمري       | ندى السيف       | شيماء القعود |
| بسام الخرجي      | حمد الجبير        | لطيفة الخضيرى   | مجدلى الخضير |
| سعد الغدير       | نواف آل الشيخ     | غادة العريفى    | رنا المزروع  |



## Team leaders:

فواز الحقيلى رزان العبيد

## Sub leader:

ساره الحميضى



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