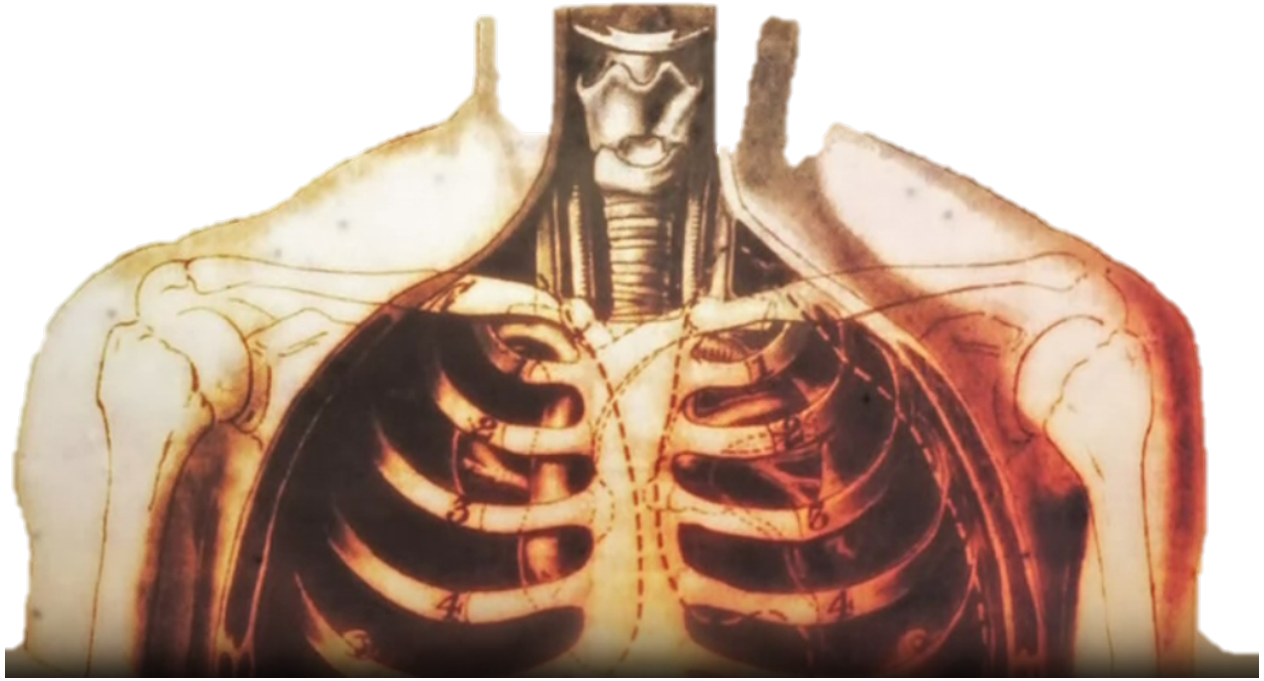
Anatomy Team
433

King Saud University
College of medicine
Foundation block

Nervous System



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.
- Define neurons and neuroglia.
- 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 structures protecting the central nervous system.

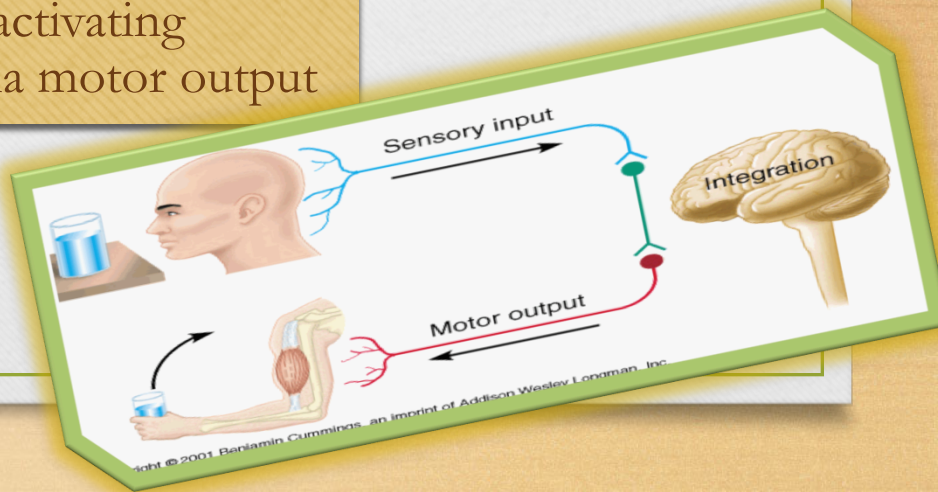
The nervous system has three functions:

Collection of sensory input

Identifies changes occurring inside and outside the body by using sensory receptors. These changes are called stimuli

Integration: Processes, analyses and interprets these changes and makes decisions

It then **effects a response** by activating muscles or glands (effectors) via motor output



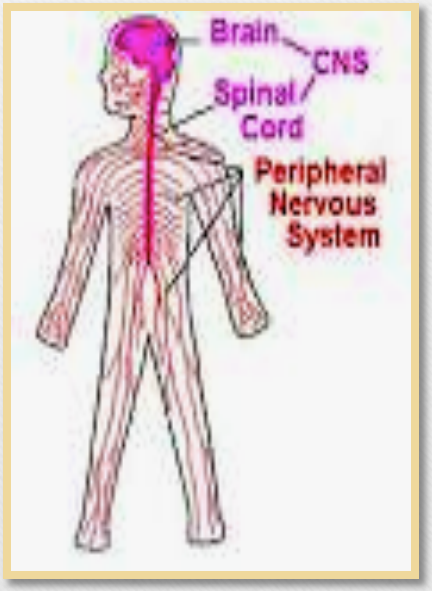
Structural Organization

Peripheral Nervous System (PNS):

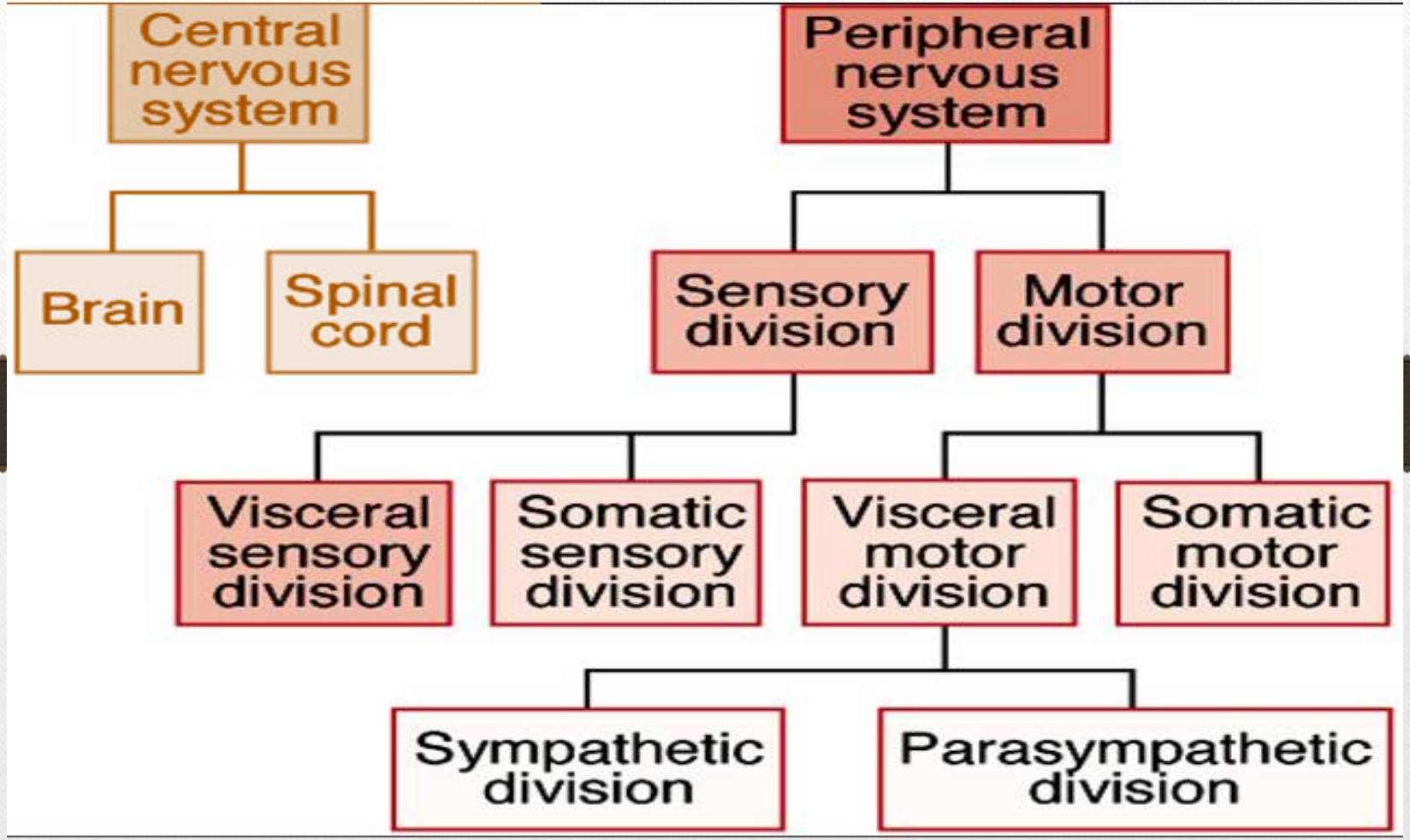
Nerves & ganglia

Central Nervous System (CNS):

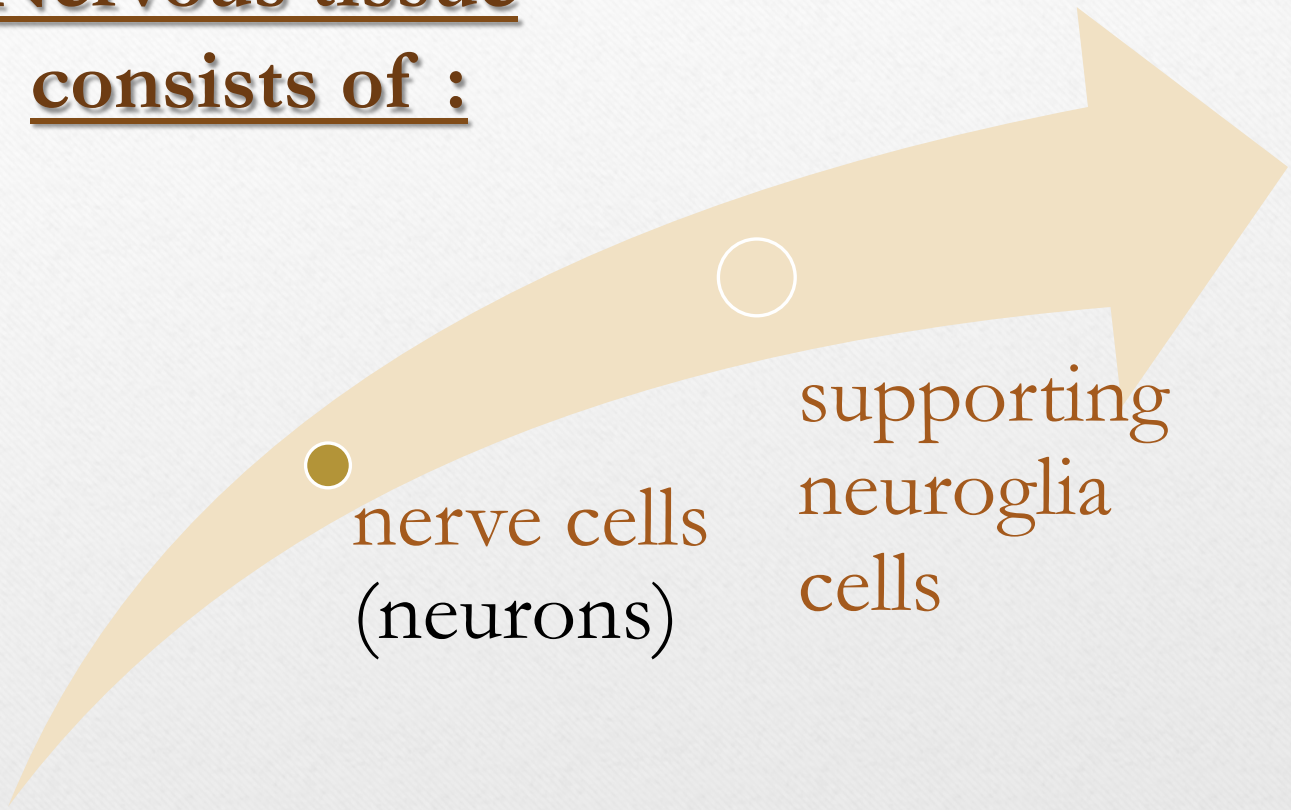
Brain & Spinal cord

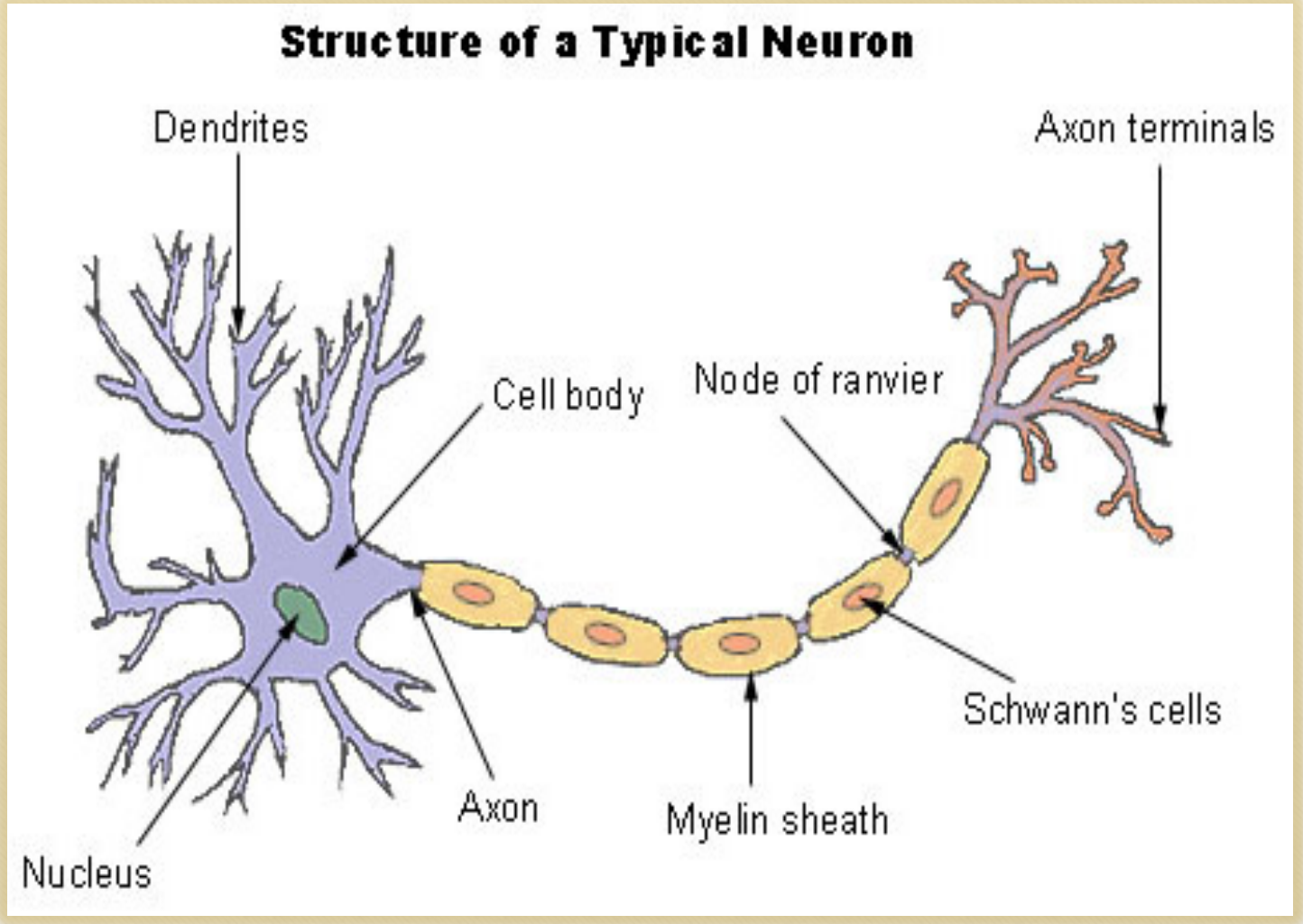


Functional Organization



Nervous tissue consists of :



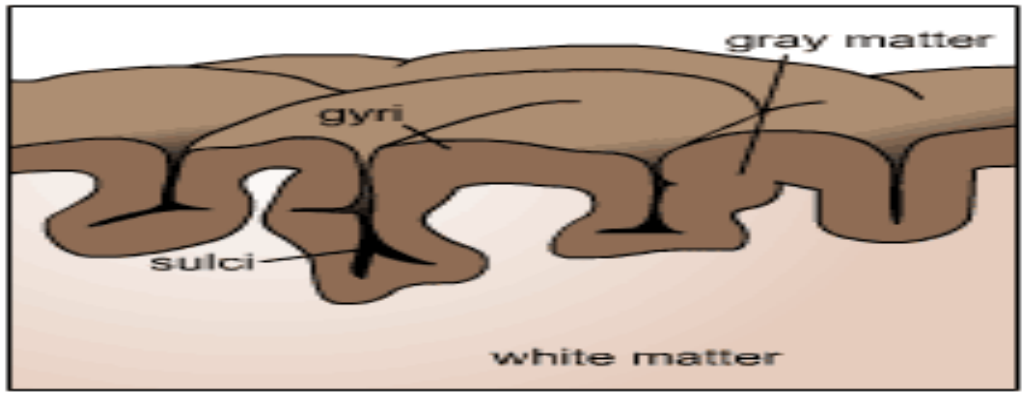

Structure of a Typical Neuron
Dendrites
Axon terminals
Cell body
Node of ranvier
Schwann's cells
Axon
Myelin sheath
Nucleus

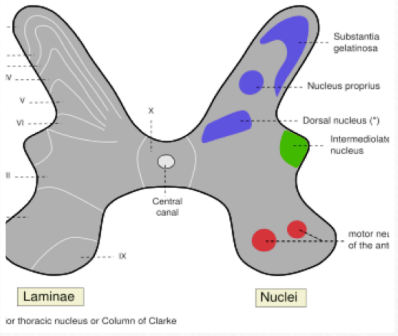
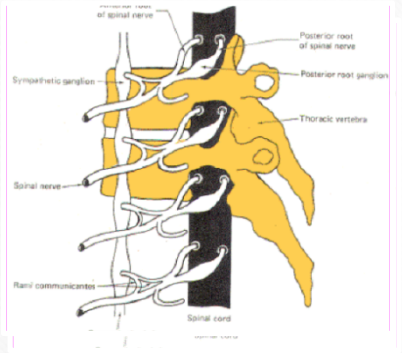
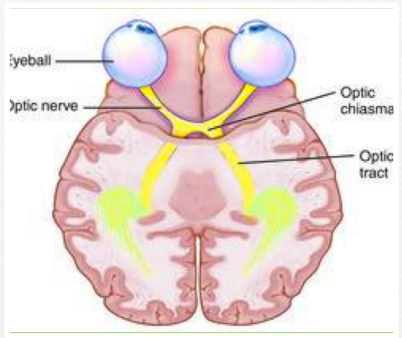
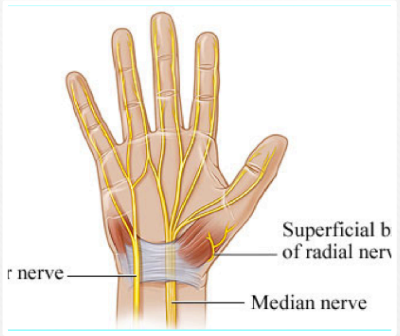
Nervous tissue is organized as:

Grey matter: which contains the cell bodies & the processes of the neurons, the neuroglia and the blood vessels

White matter: which contains the processes of the neurons (no cell bodies), the neuroglia and the blood vessels

Figure AB-9: White / Gray Matter



	PNS	CNS
NEURONS	 A group of neurons within the CNS is called a **nucleus**	 A group of neurons outside the CNS is called a **ganglion**
NERVE FIBERS (AXONS)	 A group of nerve fibers (axons) within the CNS is called a **tract**	 A group of nerve fibers (axons) outside the CNS is called a **nerve**

The Brain

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

- **Cerebrum (Cerebral hemispheres)**
- **Cerebellum**
- **Diencephalon: Thalamus, Hypothalamus, Subthalamus & Epithalamus**
- **Brainstem:**
  - -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**

Divided by deeper grooves, into **4 lobes:**

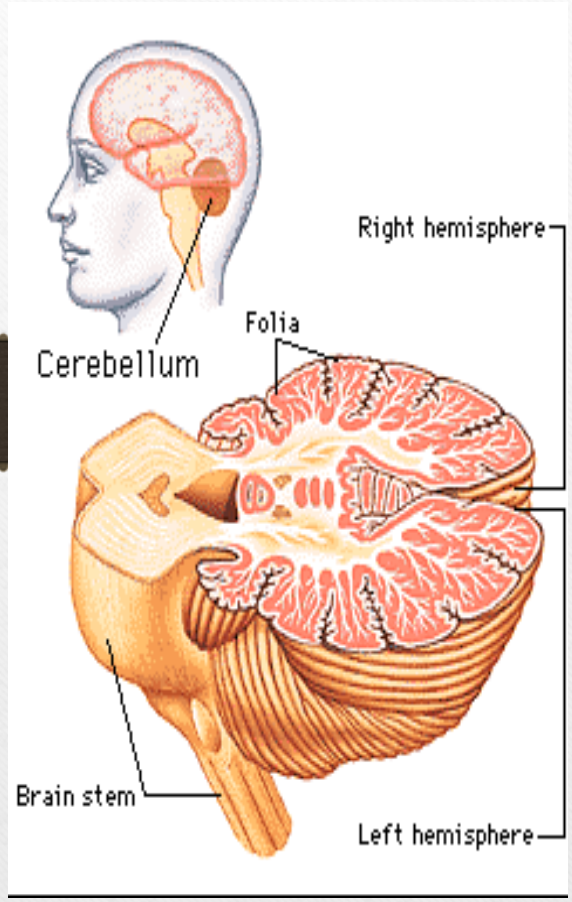
- Frontal
- Parietal
- Temporal
- Occipital

TISSUE OF THE CEREBRAL HEMISPHERES

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 made from gray matter and an inner region of white matter. It provides precise coordination for body movements and helps maintain equilibrium.

Small details

- ✓Bundle of nerve fibers → nerve.
- ✓Neurons → a cell with many processes.
- ✓unipolar → 1 process.
- ✓bipolar → 2 processes.
- ✓multipolar → many processes.
- ✓Peripheral nervous system → any thing outside the CNS.
- ✓Myelinated axon → have myelin sheath (increase the rate of transmitting impulses through the axon).
- ✓Unmyelinated → don't have myelin sheath.

Sympathetic vs. Parasympathetic		
Both	Balance the activity of the body	
Individually	**Sympathetic**	**Parasympathetic**
	Increase the activity of the body systems Ex: increase heart rate	Decrease the activity of the body systems Ex: decrease heart rate

Small details

Function of dendrite:
Bring the messages from the PNS to CNS
Sensory : PNS to CNS
Motor : CNS to PNS
Somatic → under your control
Autonomic (visceral) → not under your control

Single	plural
Ganglion	ganglia
Ramus	rami

Spinal Cord

- It has 2 conduction pathways:
- To the brain & a major reflex center

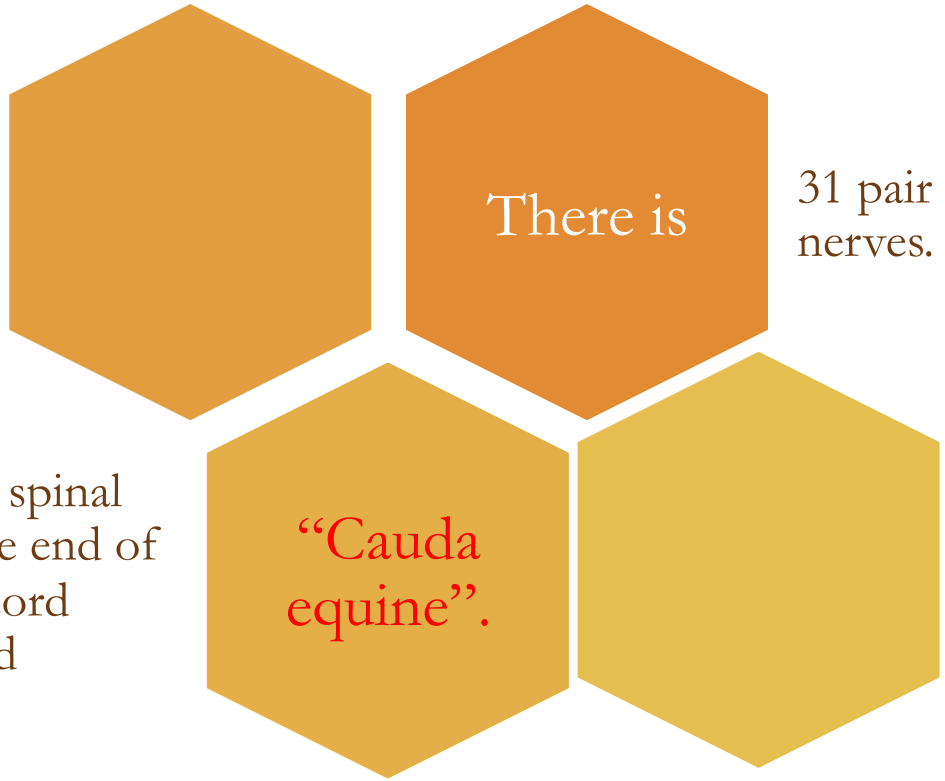
Extends from the foremen magnum to L2 vertebra.

Spinal cord will end at lower border of Lumbar region of vertebral column.

It continuous above	Caudal tapering end is called	Has 2 enlargements
• medulla oblongata	• conus medullaries	• Cervical • Lumbosarcal

Cervical enlargement gives nerves supply to the upper limbs.

Lumbosarcal enlargement gives nerves supply to lower limbs.



<u>Cauda equine</u> group of nerves looks like horsetail that responsible for supplying the lower limbs as well.

Cross section of spinal cord :

The spinal cord is incompletely divided into 2 equal parts:

Anteriorly by a short shallow shallow :	"median fissure"
Posteriorly by a deep narrow:	"median septum"
Composed of:	Grey matter "innermost layer" white matter "outer layer"
The arrangement of grey matter resemble to letter H having 2 of:	Dorsal horn Lateral horn Ventral horn Central Canal at the middle

There is 2 Types of Peripheral Nerves:

Cranial

- 12 pair of Nerves
- attached to brain "cerebral"
- named & numbered from 1-12

Spinal

- 31 pair of spinal nerves
- attached to spinal cord
- named & numbered according to regions of spinal cord.
- e.g. L2> 2nd lumbar vertebra.

The Peripheral Nerves are; **Sensory, Motor& Mixed.**

Cranial Nerves:

12 pair of nerves

As we mentioned earlier, there are.

*** These are very important***

- **4 pairs are mixed**

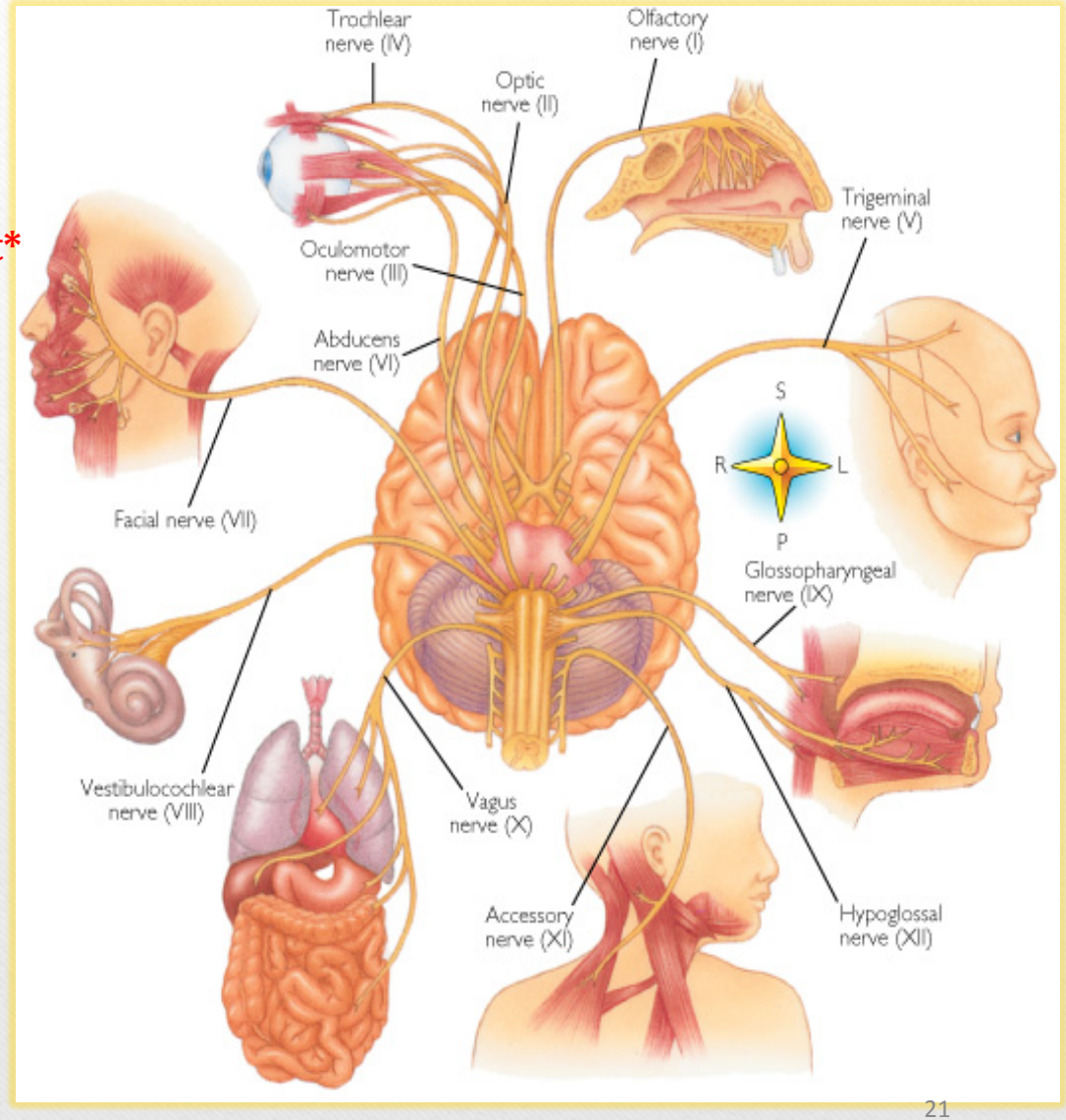
trigeminal n.(5th)
facial n.(7th)
glossopharyngeal n.(9th)
vagus n.(10th)

- **5 pairs are motor**

occulomotor 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)



Spinal nerves:

31 pairs of nerves, each spinal nerve is attached by 2 roots:

Dorsal "posterior" >sensory
dorsal root bears > dorsal sensory ganglia (DRG)

- Ventral "anterior" >motor

They are divided from intervertebral foremen into:

- Dorsal remus

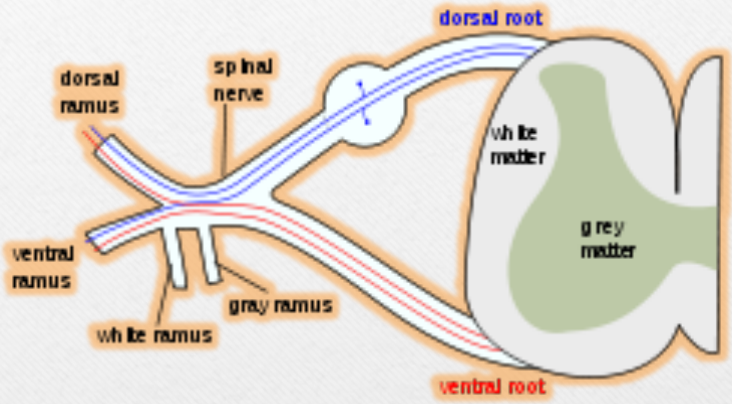
it supplies the skin and back muscles

- Ventral remus from plexuses

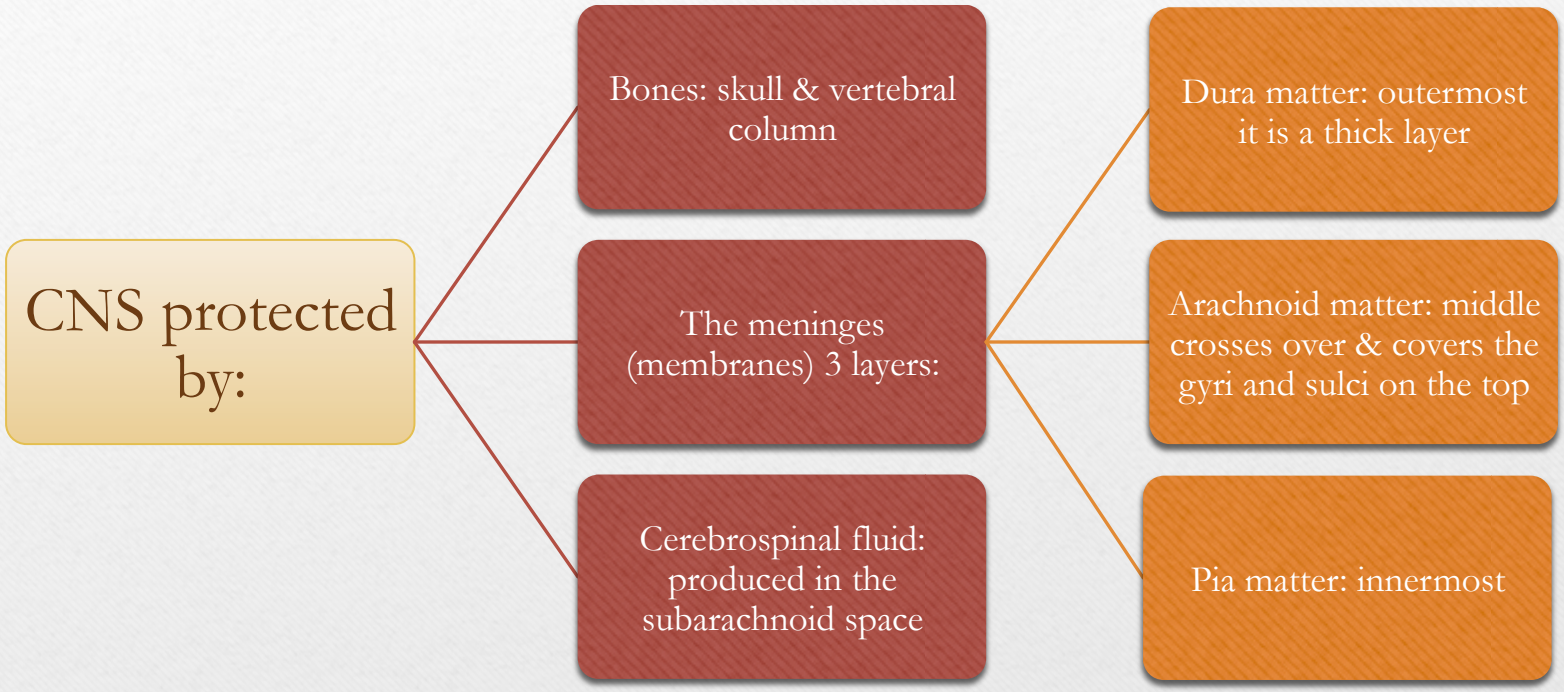
supplies anterior part of the body

- Except the thoracic region where they from the intercostal nerves*

Both contain sensory and motor fibers

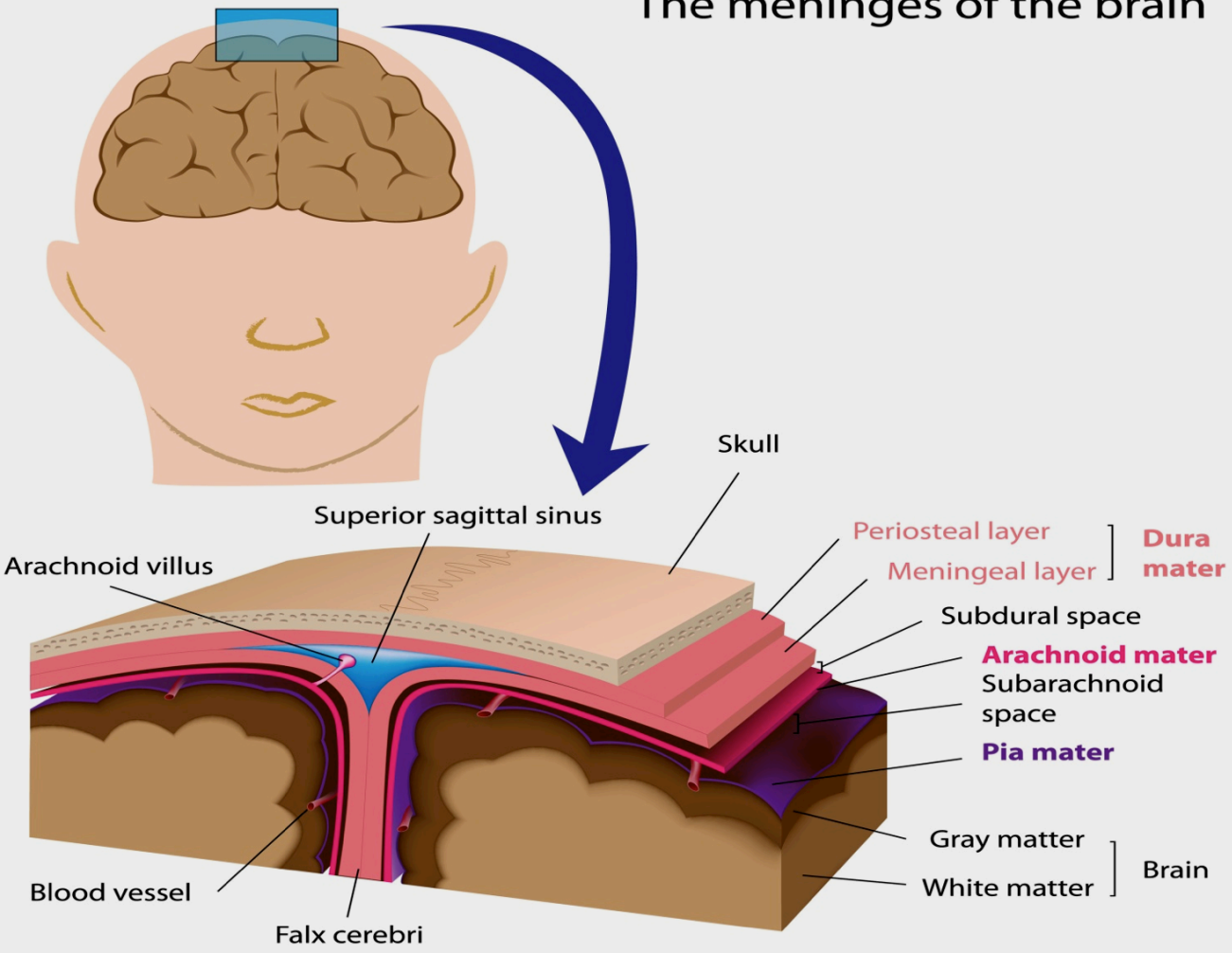


Protection of the CNS :-



Dermatome: a single spinal nerve supplies the skin

The meninges of the brain



CEREBROSPINAL FLUID

1	**CSF is constantly produced by the choroid plexuses inside the ventricles of brain.**
2	Most of the CSF drains from the ventricles into the subarachoid 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.

Anatomy of the Spinal Cord and How it Works (3 m):
https://www.youtube.com/watch?v=zxpb1-okVig&feature=youtube_gdata_player

The Human Nervous System Part 1 (10 m) :
http://www.youtube.com/watch?v=4M82WwFACLg&feature=youtu.be

The Human Nervous System Part 2 (9 m):
http://www.youtube.com/watch?v=PE2b5go7V_0&feature=youtu.be

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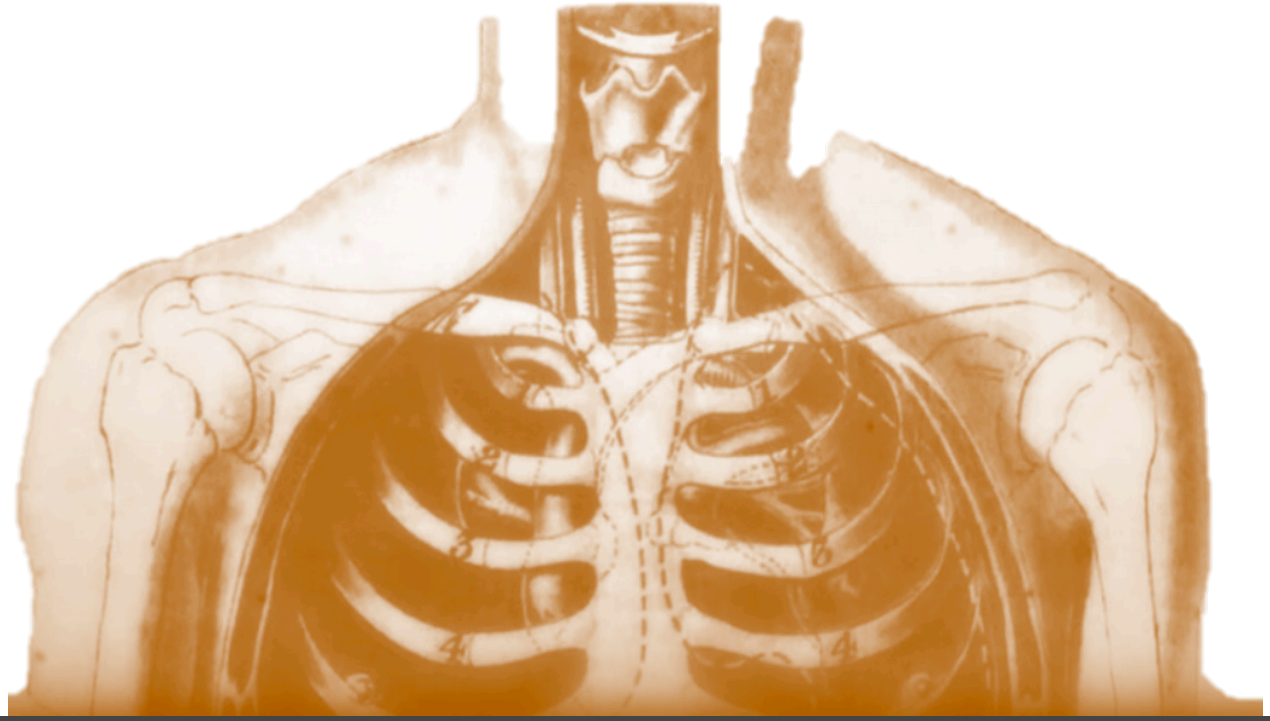
done by : Ghadah Alhindi & Jumanah Albeeybe

Coordinated by:
Rahma alshehri & Omar Almutair



Good luck

For any comments or mistakes please don't forget to contact with us by this email :

anatomy433@live.com

Anatomy Team 433

Designed by: Sarah Al-Kharashi