

Anatomy Nervous system

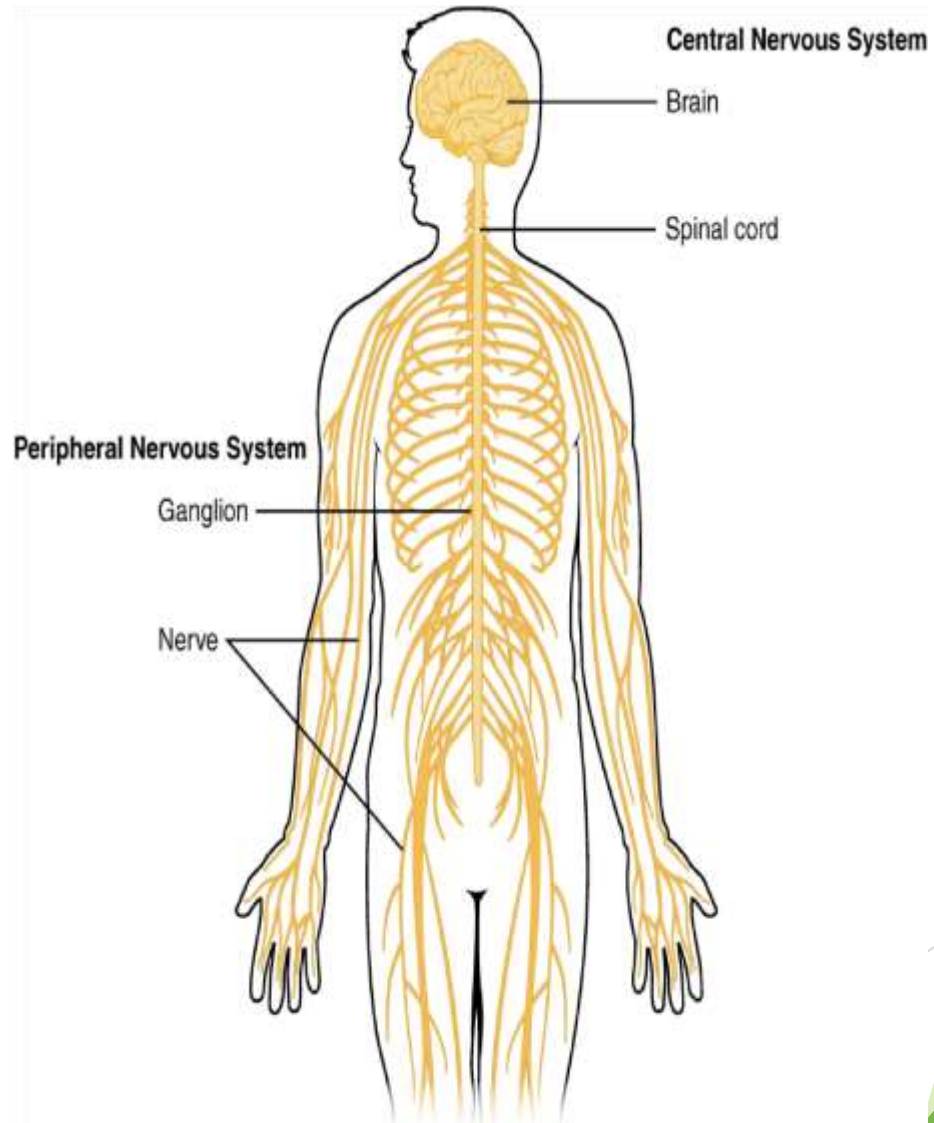
**By
Assistant lectur: Ali Jamal**

Introduction

Nervous System

The human **Nervous system** is the most complex system in the human body , is formed by a network of more than **100 million** nerve cells (**neurons**) assisted by many more **glial cells** . **Anatomically** the nervous system is divided into the **Central Nervous System** consisting of the brain and the spinal cord and the **Peripheral Nervous System**, composed of the nerve fibers and small aggregates of nerve cells called nerve ganglia.

PNS



CNS

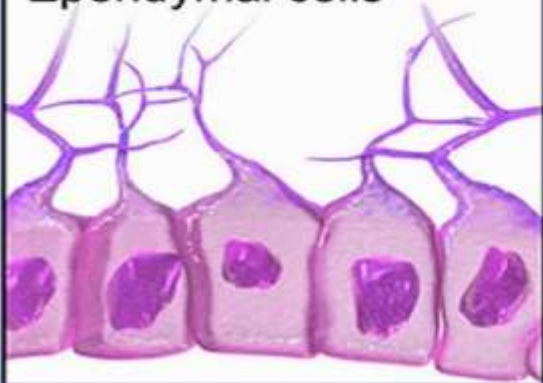


Structurally ,nerve tissue consist of two cell types : **nerve cells** or neurons ,which show numerous long processes and several types of **glial cells**, which have short processes, support and protect neurons and participate in neural activity , nutrition and the defense processing in the **Central Nervous System**.

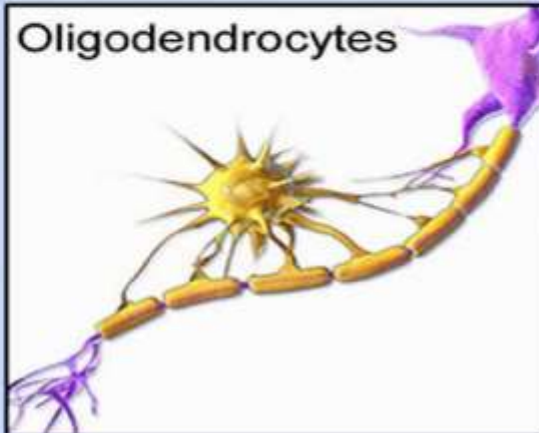
Types of Neuroglia

Central Nervous System

Ependymal cells



Oligodendrocytes



Astrocytes

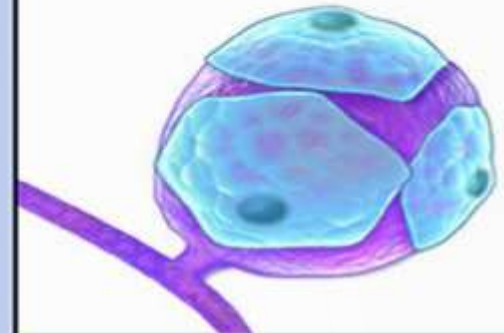


Microglia

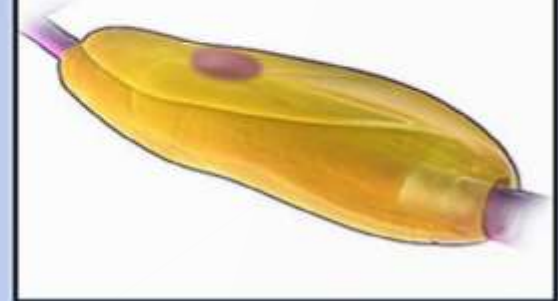


Peripheral Nervous System

Satellite cells



Schwann cells



Neuron structure

basic structural features

- a typical neuron has a **cell body** .
- Projecting from the cell body are processes called *Dendrites and Axons* .
- The cell body serves as neuron's control center and is responsible for receiving , integrating and sending nerve impulse .
- The cell body enclosed by plasma membrane contains cytoplasm , surrounding a nucleus , a nucleus contain a nucleolus .

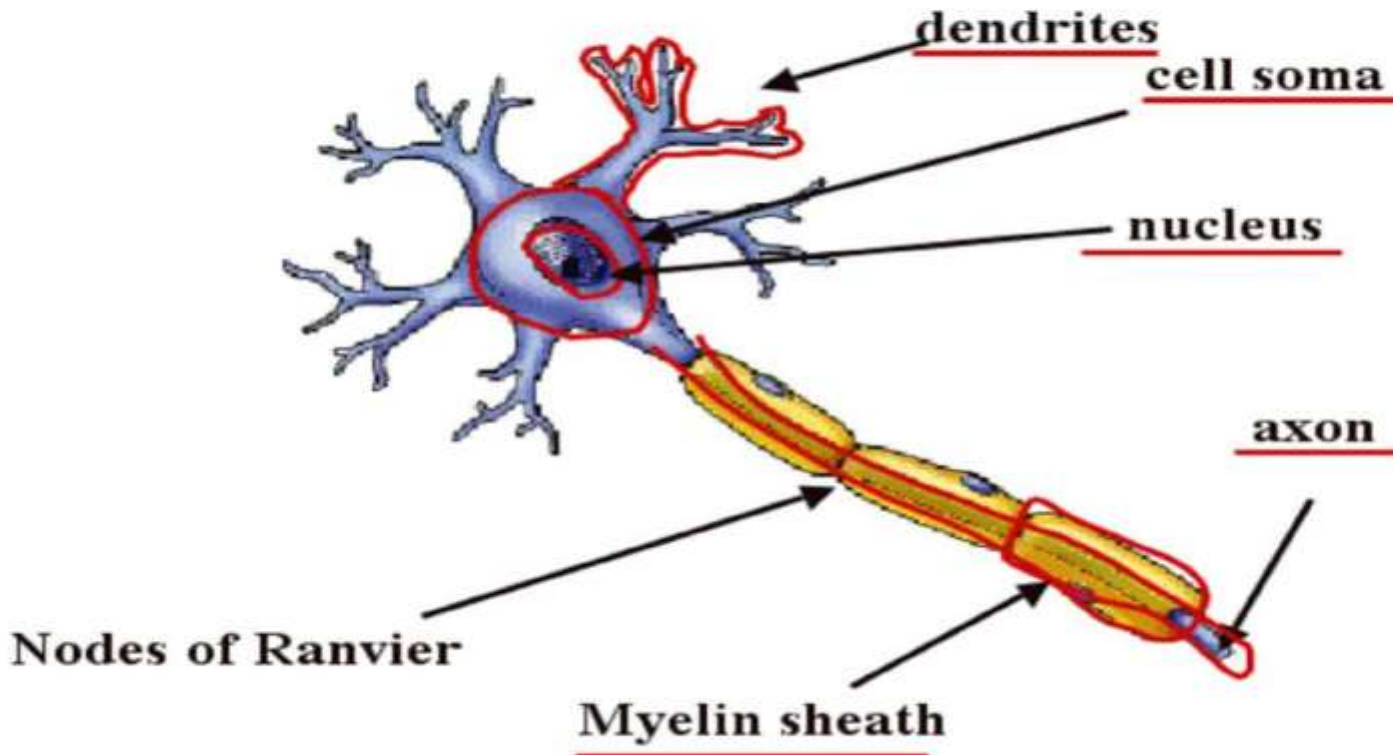
Dendrites :

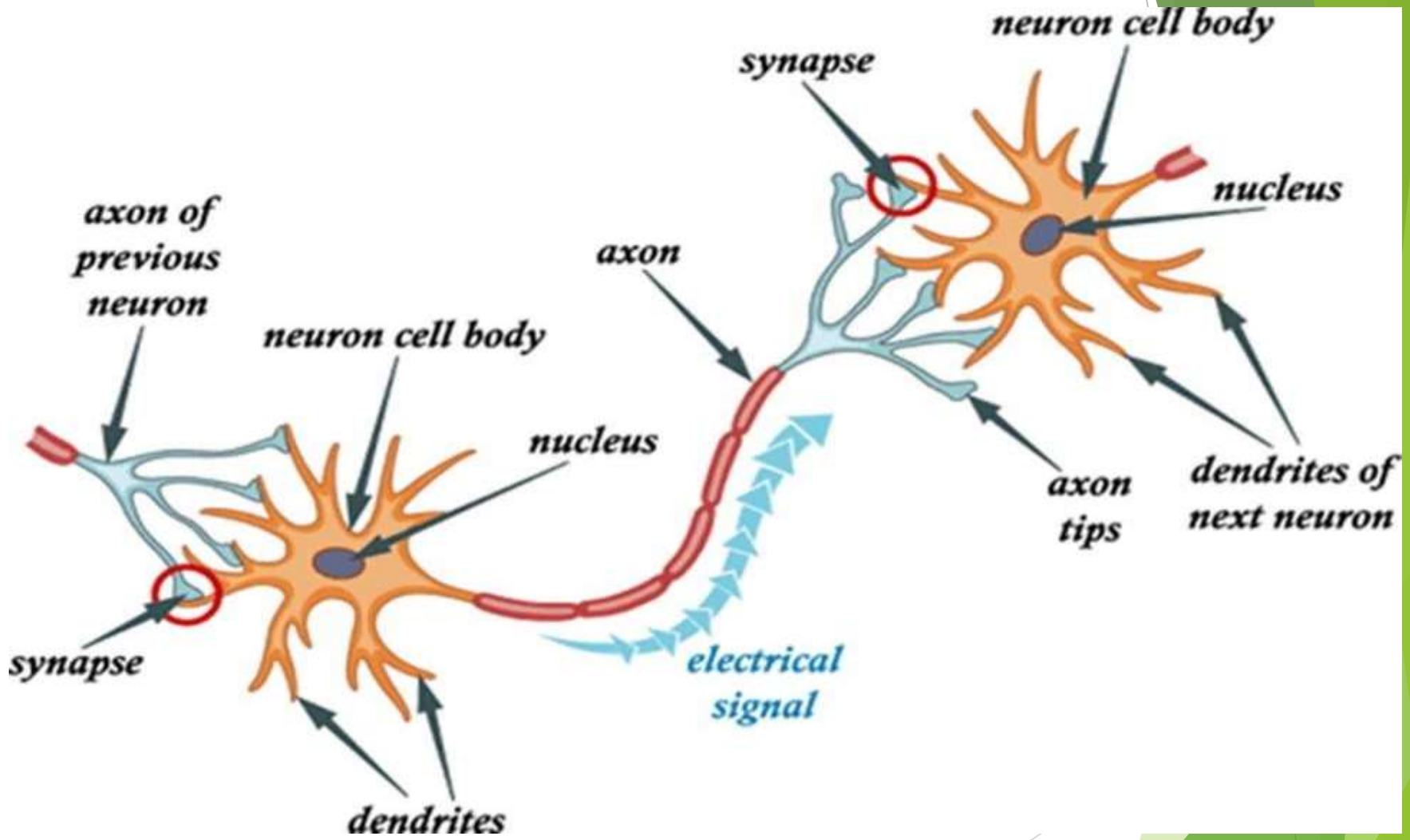
- Processes that branch off the cell body
- Conduct nerve impulses toward the cell body
- The more dendrites a neuron has , the more nerve impulses that neuron can receive from other cells.

Axons :

- Larger , longer nerve cell process projecting from the cell body , sometimes called **nerve fiber**.
- All neurons have only one axon .
- it transmits a nerve impulse away from the cell body toward another cell (transmits output information to other cells)

Neuron general structure





Nervous system division

A- Structural division :

- **Central nervous system (CNS)** : Consists of brain and spinal cord .
- **Peripheral nervous system (PNS)**: Consists of nerves , cranial nerves and spinal nerves .

B- Functional division :

- **Sensory (afferent division)**: (Input)

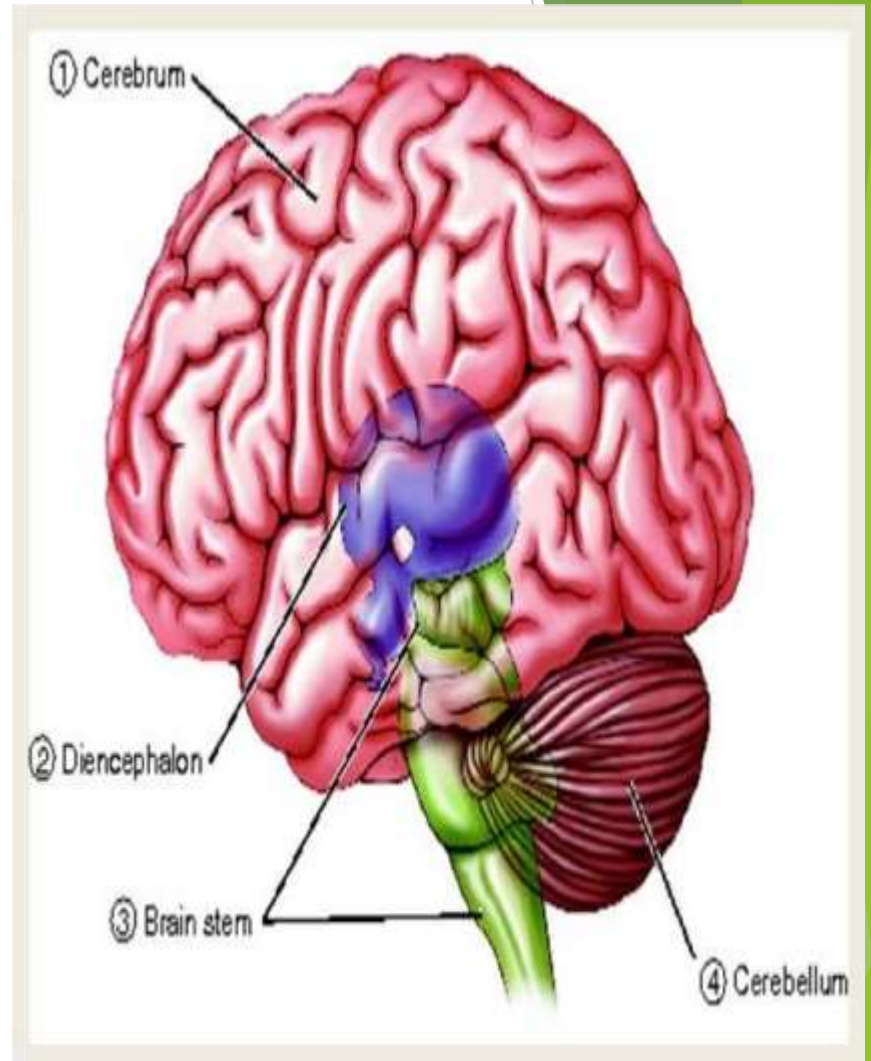
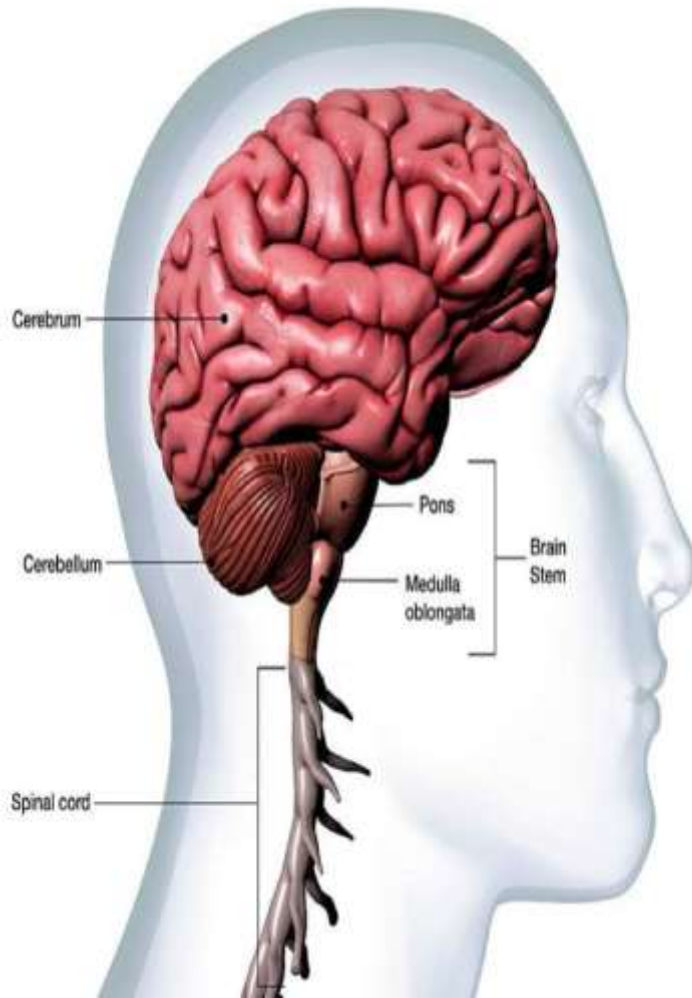
(transmits information from periphery to CNS , contain receptors)

- **Motor (efferent) division** : (output) transmit information from CNS to the rest of the body , sends motor information to effectors .

Brain and Cranial Nerves

The brain is divided into four major regions:

- The Cerebrum
- The Diencephalon
- The Brain stem
- The Cerebellum

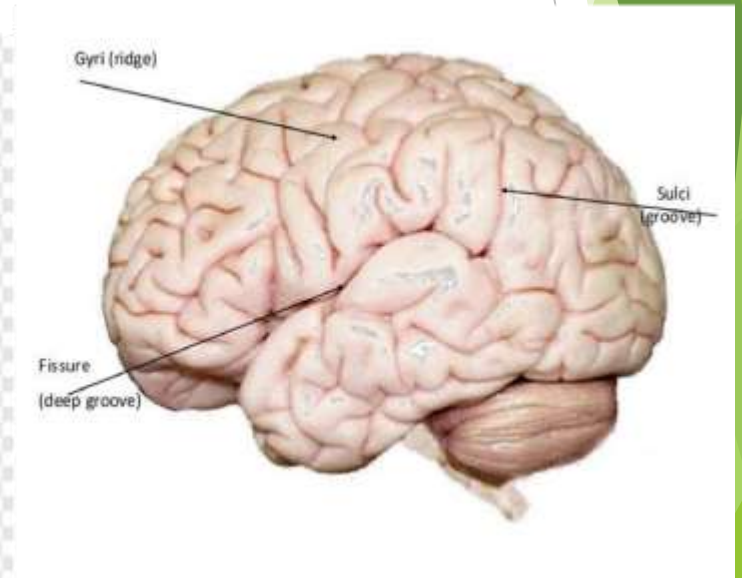
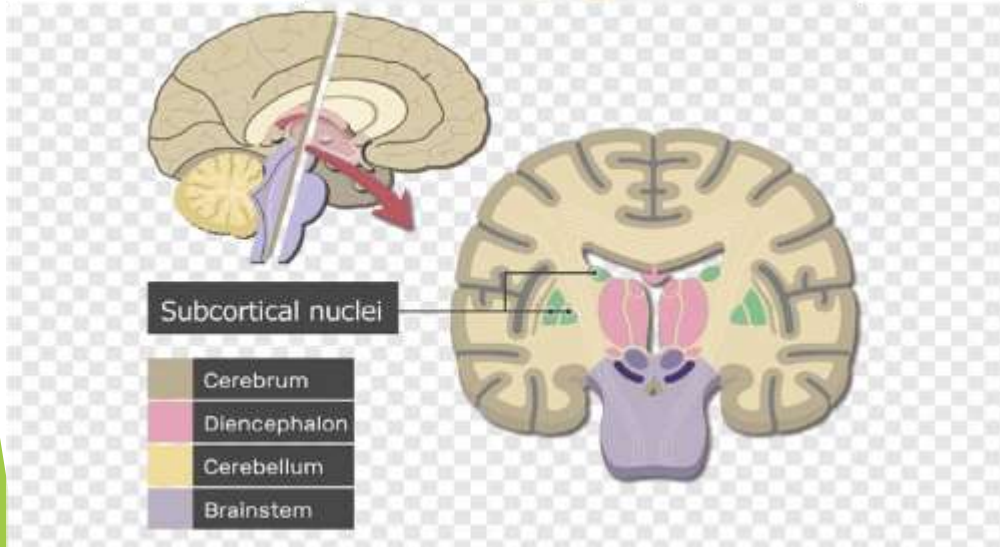
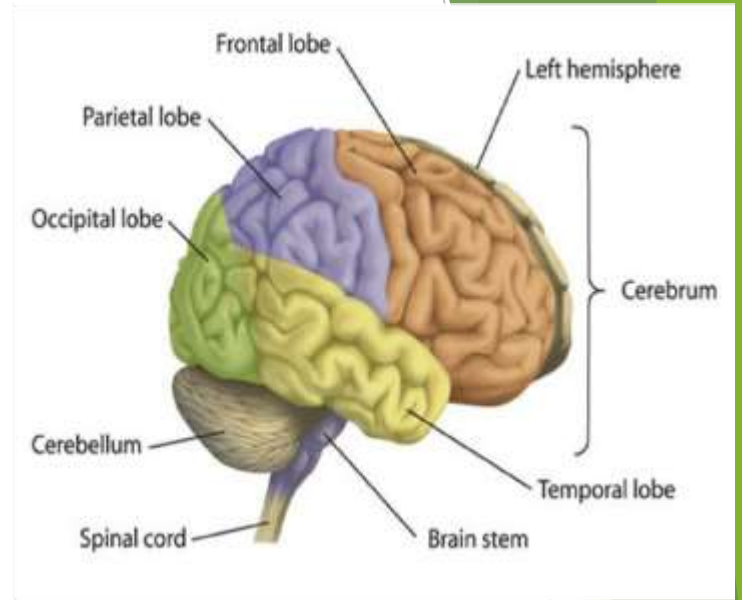
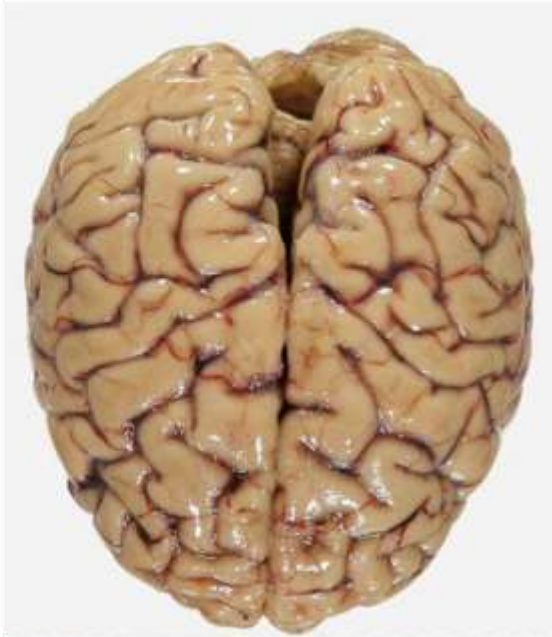


When viewed superiorly , the cerebrum is divided into **two halves** called the left and right **cerebral hemispheres** .

- Each hemisphere may be further subdivided into five functional areas called “ **lobes** “ .

- The outer surface of an adult brain exhibits folds called **Gyri** (gyrus) , and shallow depressions between those folds called **sulci** (sulcus) .

- The brain is associated with 12 pairs of **cranial nerves** .

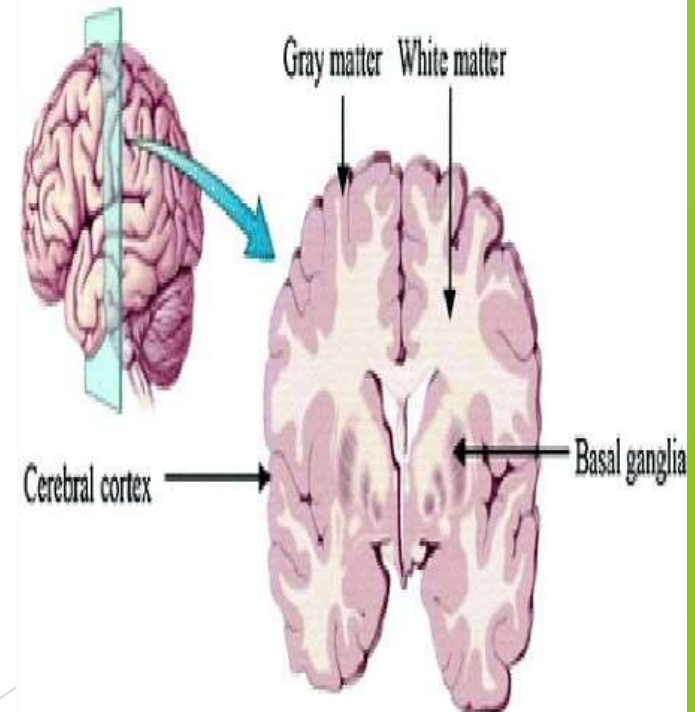
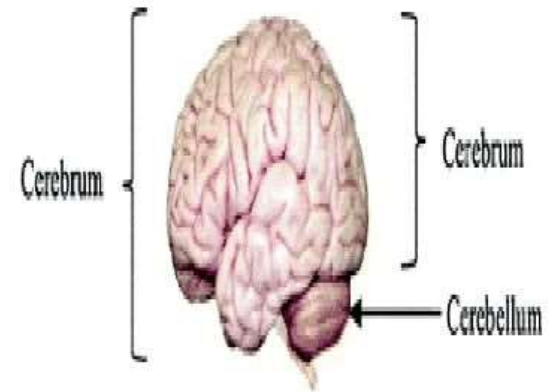


Organization of the brain tissue :

Two distinct tissue areas are recognized within the brain and spinal cord (gray matter and white matter).

- **Gray matter houses** : motor neurons , dendrites and unmyelinated axons.
- **White matter** : derives its color from the myelin in the myelinated axons.

The external sheets of gray matter , called **cortex** , cover the surface of most of the adult brain.



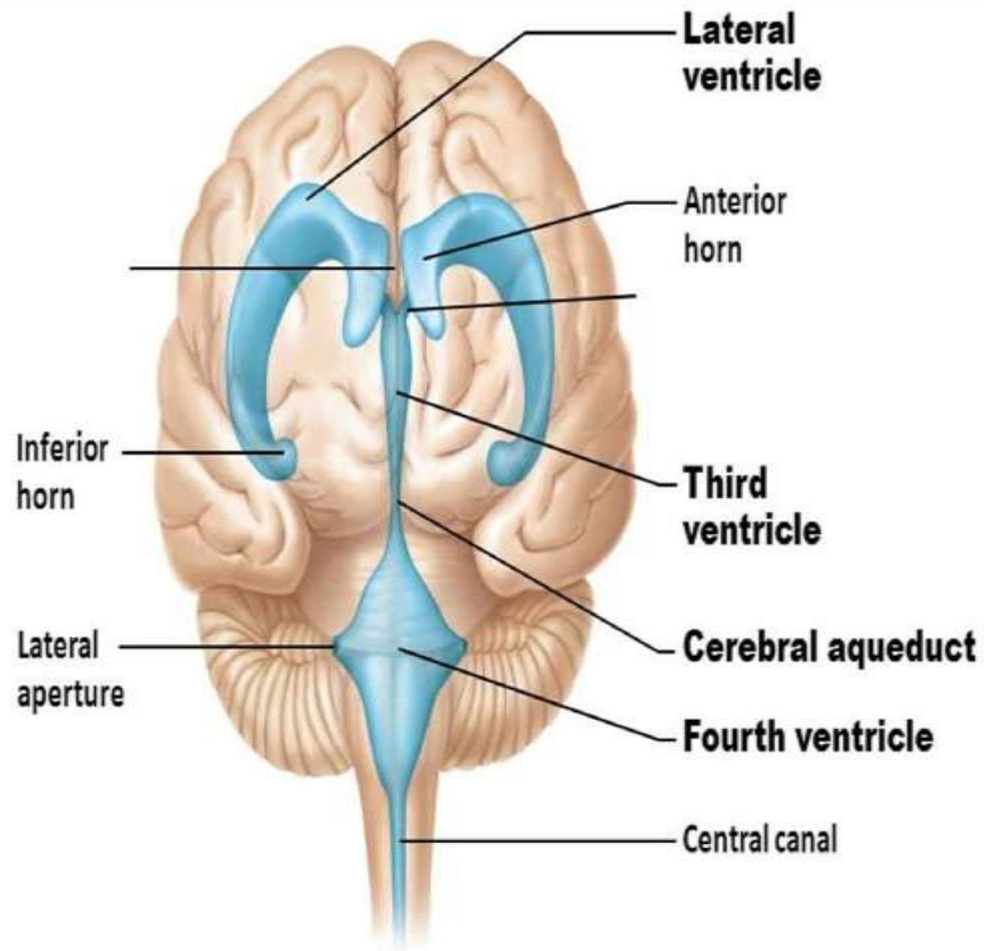
Brain ventricles

Ventricles are cavities or expansions within the brain . the ventricles are continuous with one another as well as with the central canal of the spinal cord .

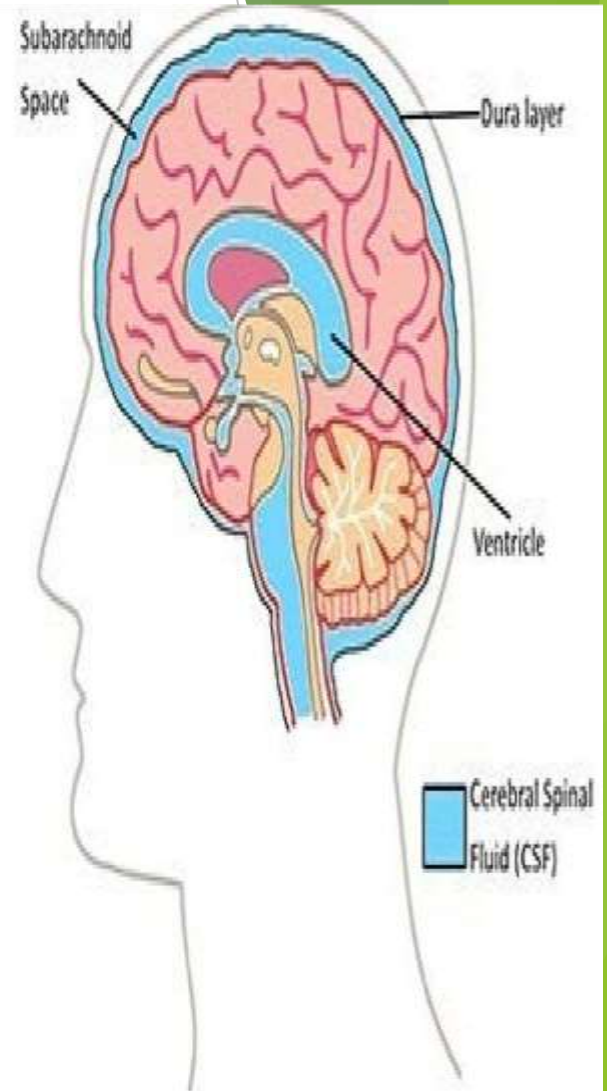
There are four ventricles in the brain :

- **Two lateral ventricles (in cerebrum)**
- **The third ventricle**
- **The fourth ventricle**

All of the ventricles contain cerebrospinal fluid (CSF).



(a) Anterior view



Cerebrum :

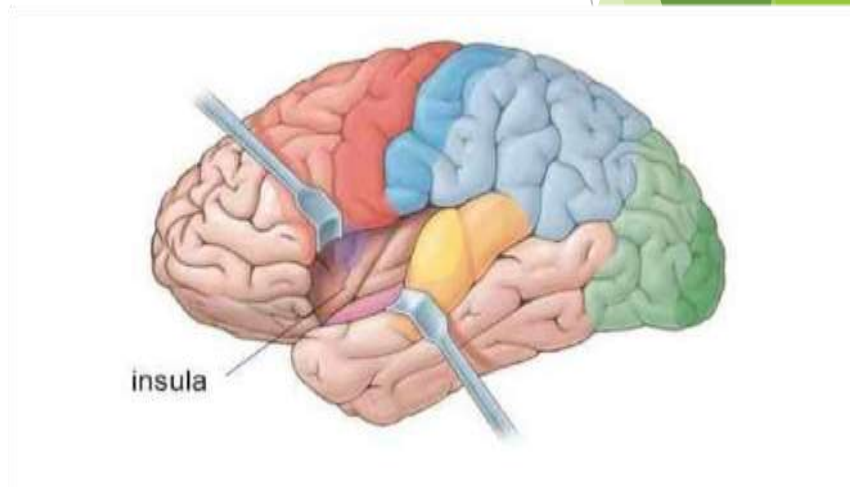
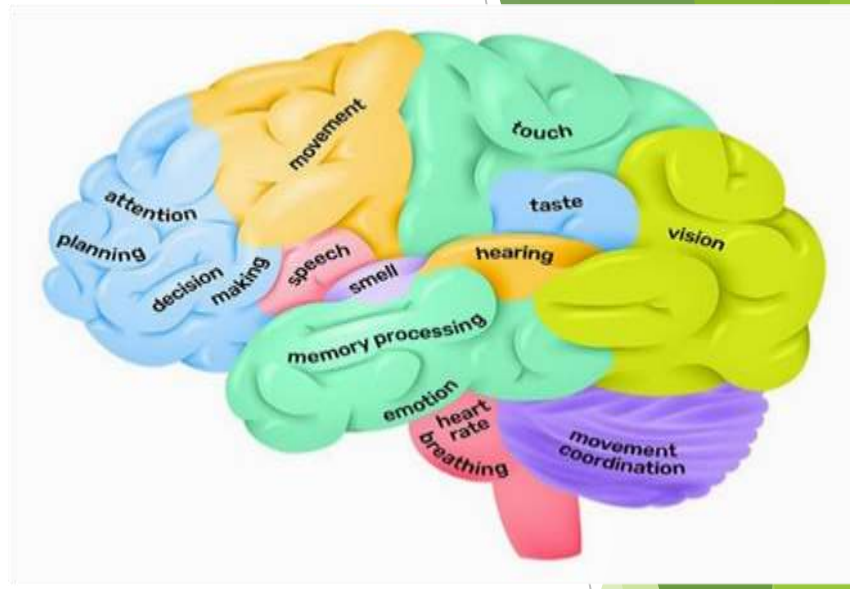
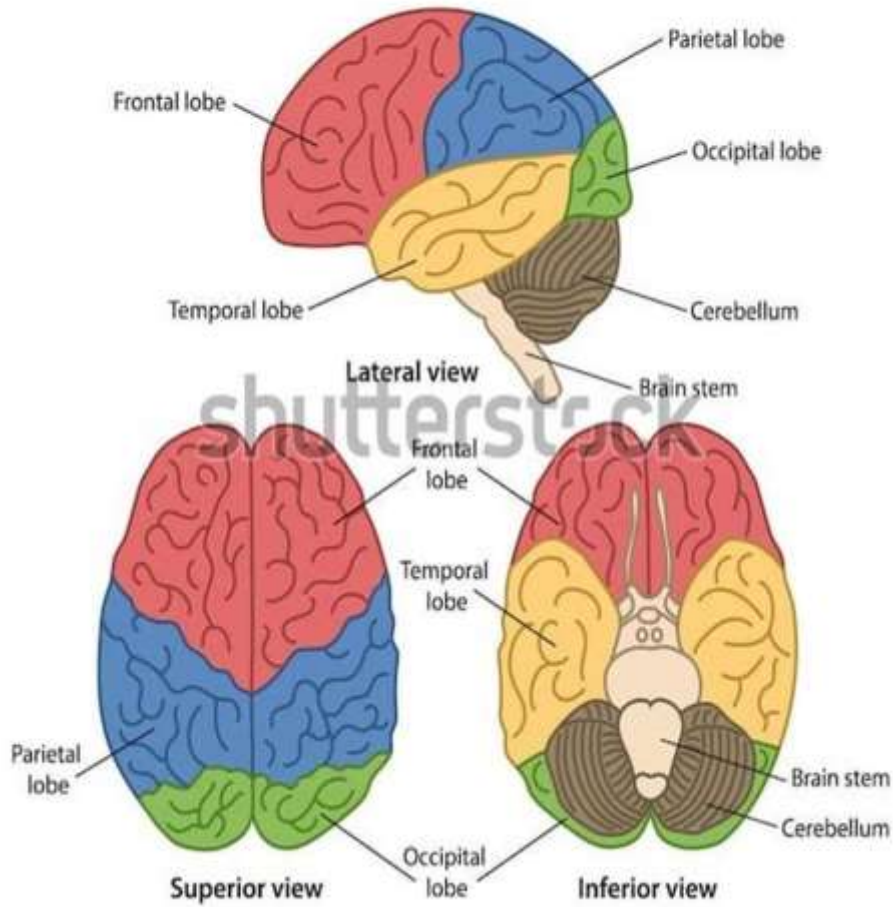
Composed of two halves : left and right **cerebral hemispheres**.

The Right cerebral hemisphere controls the left side of the body , and vice versa.

Lobes of the cerebrum :

- **Frontal lobe** : (high intellectual functions) Concentration, decision making ,planning, personality, verbal communication, voluntary motor, control of skeletal muscles .
- **Parietal lobe** : understanding speech and formulating words
- **Temporal lobe** : auditory and olfactory sensation
- **Occipital lobe** : visual
- **Insula** : taste and memory

Parts of the Human Brain



Diencephalon :

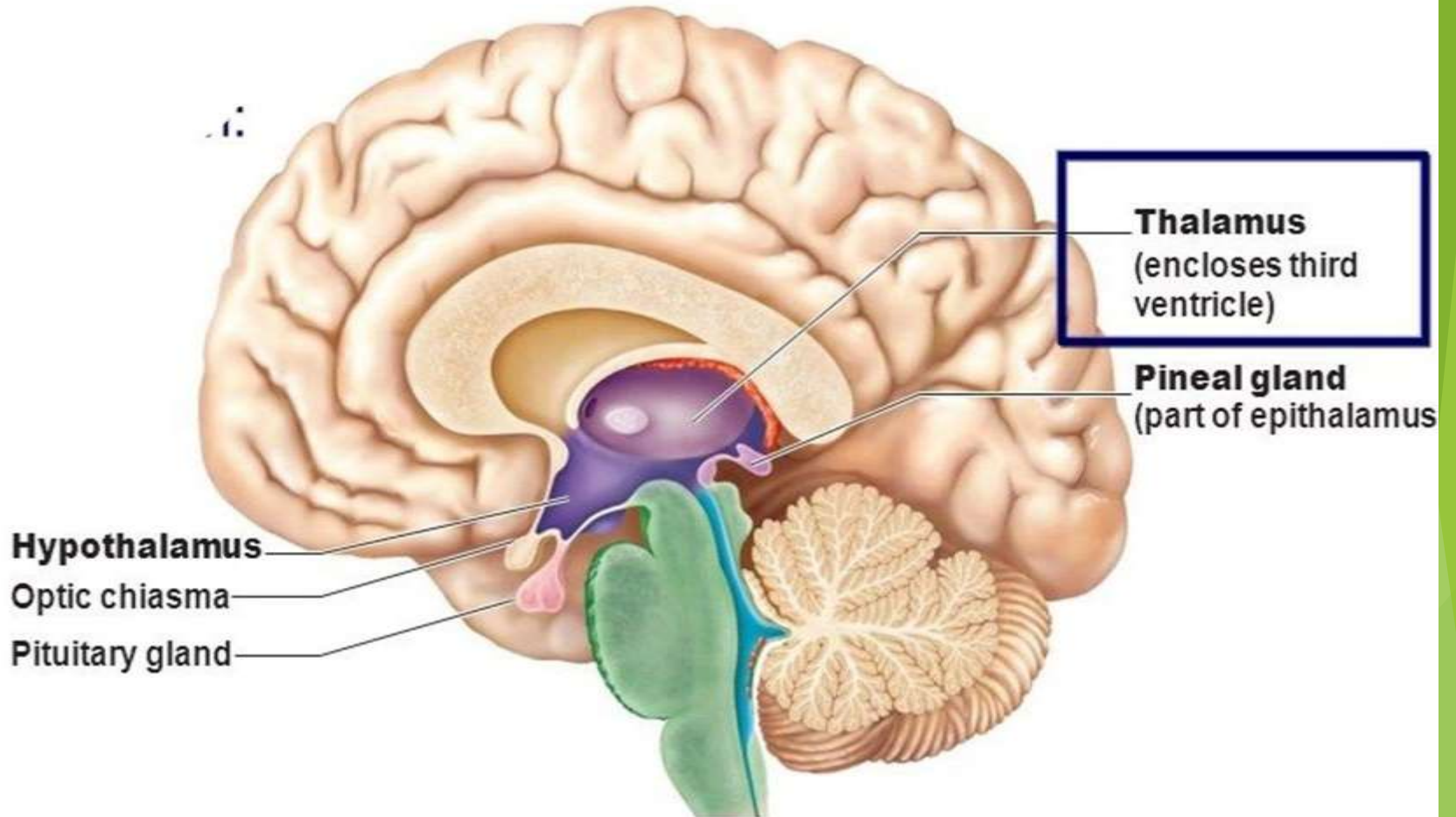
Diencephalon Consist of :

1- Epithalamus : (houses pineal gland)(endocrine gland) which secrete the hormone melatonin which regulate the day-night cycles (circadian rhythm).

2- Thalamus :Is the principal and final relay point for sensory information that will be processed and projected to the primary somatosensory cortex .

3- Hypothalamus Functions :

- Master control of endocrine system
- Regulation of body temperature (shivering – sweating)
- Control of emotional behavior
- Control of food intake
- Control of water intake
- Regulation of sleep – wake rhythm (acting as the body's biological clock).



Brain stem :

It is a bidirectional passageway for all tracts extending between the cerebrum and the spinal cord .

Three regions form the brainstem :

- Midbrain
- Pons (respiratory center) - Medulla oblongata :

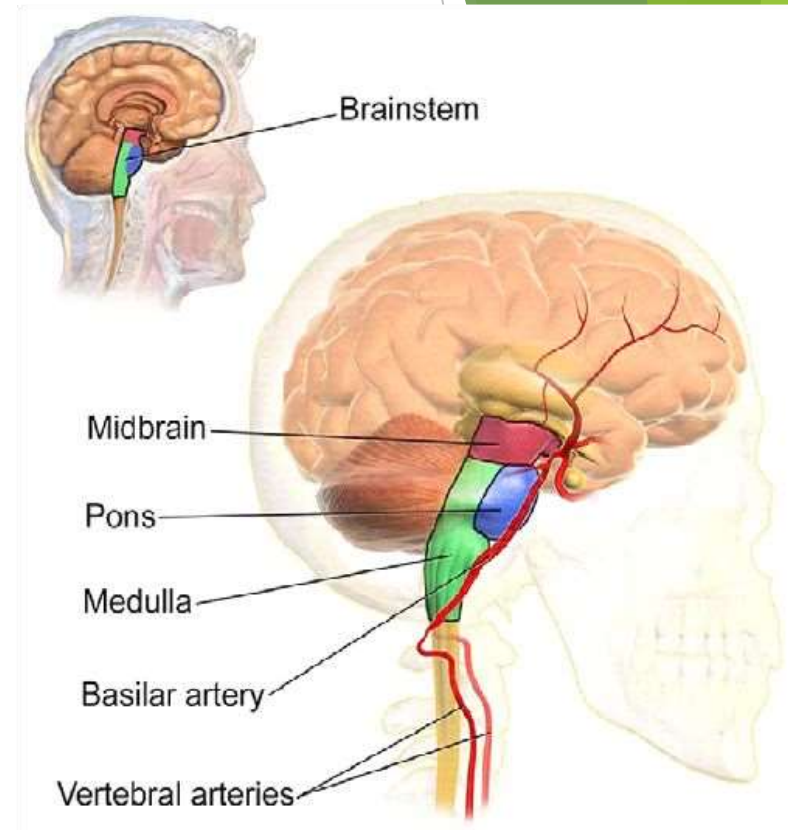
Cardiac center

Vasomotor center (blood pressure control)

Respiratory center

Others : coughing , sneezing , salivation , swallowing , gagging , vomiting

.Cerebellum : Maintain equilibrium and posture (regulates the body position)



Cranial nerves : Are part of the peripheral nervous system and originate on the inferior surface of the brain

There are 12 pairs of cranial nerves :

- 1- Olfactory (smell)**
- 2- Optic (vision)**
- 3- Oculomotor (eye movement)**
- 4- Trochlear (eye movement)**
- 5- Trigeminal (sensation in face and motor function such as biting and chewing)**
- 6- Abducent (eye movement)**
- 7- Facial (facial expression)**
- 8- Vestibulocochlear (hearing and equilibrium)**
- 9- Glossopharyngeal**
- 10- vagus (parasympathetic control of heart , lungs , digestive tract).**
- 11- accessory (some neck muscles)**
- 12- Hypoglossal (tongue)**

Olfactory I

Optic II

Oculomotor III

Trochlear IV

Trigeminal V

Abducens VI

Facial VII

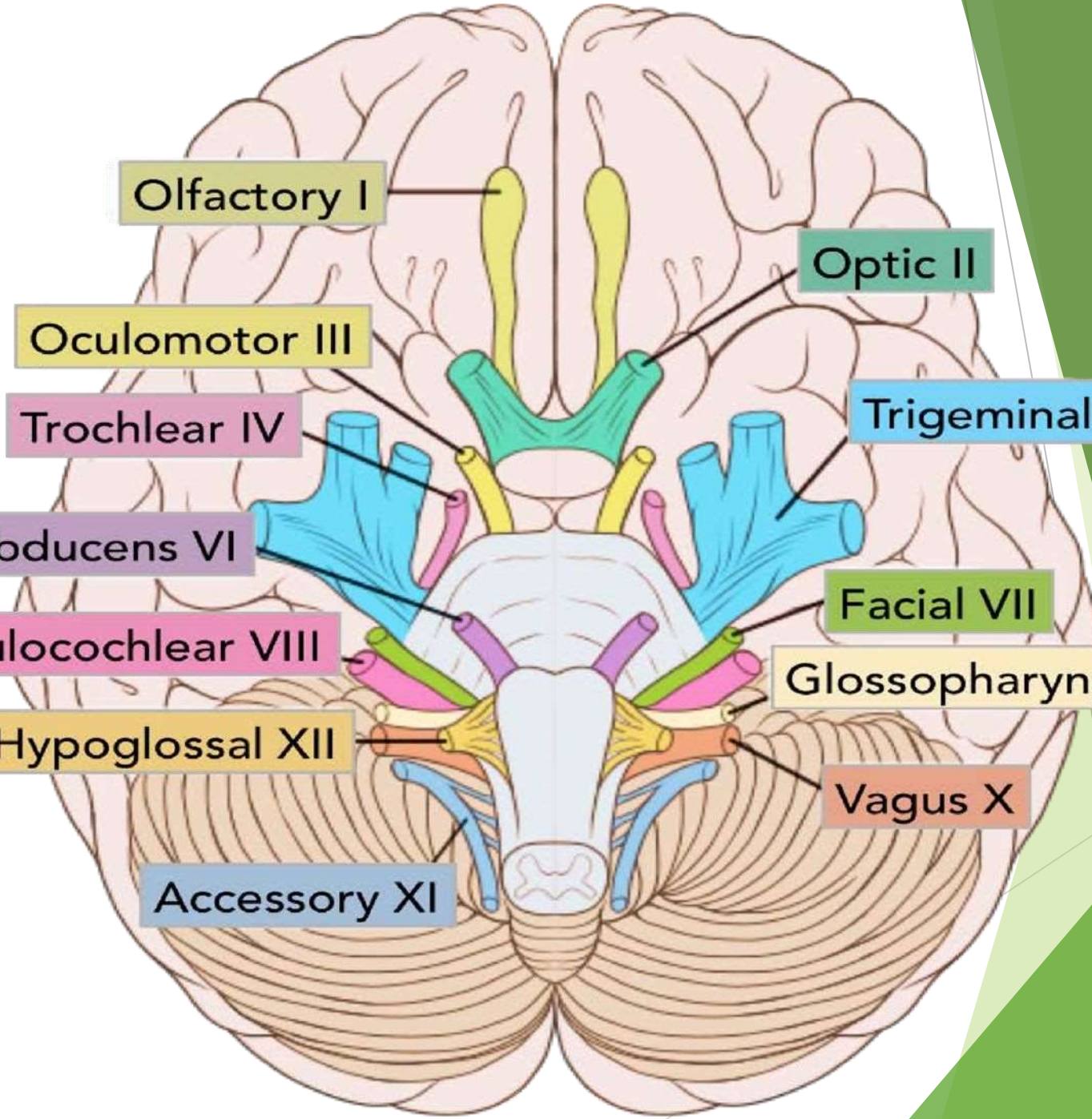
Vestibulocochlear VIII

Glossopharyngeal IX

Hypoglossal XII

Vagus X

Accessory XI



**Thank
you**