SNS COLLEGE OF PHYSIOTHERAPY
(Affiliated by the Tamil Nadu Dr. M. G. R. Medical University, Chennai.)
Saravanampatti Post, Coimbatore 35

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COURSE NAME: ANATOMY
COURSECODE : 746273
TITLE : Introduction to Nerve Anatomy

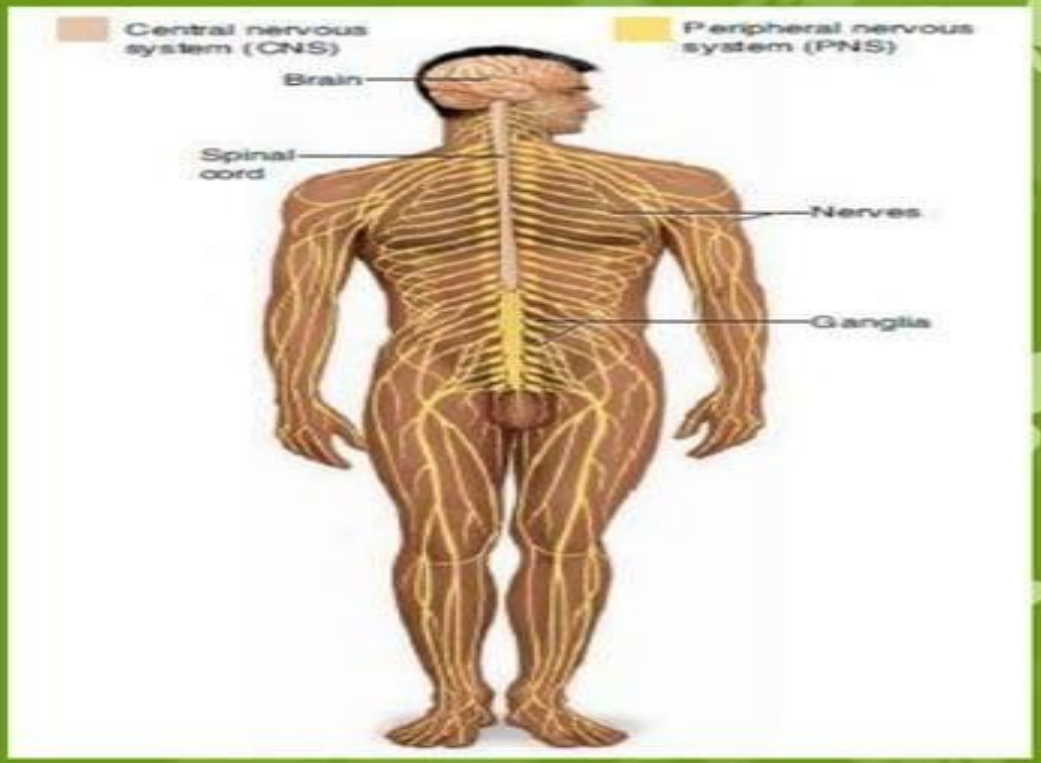
NAME : Dr. Nagaraj s MPT (ortho)., MIAP
DESIGNATION : Assistant professor

NERVOUS STRUCTURE ANATOMY

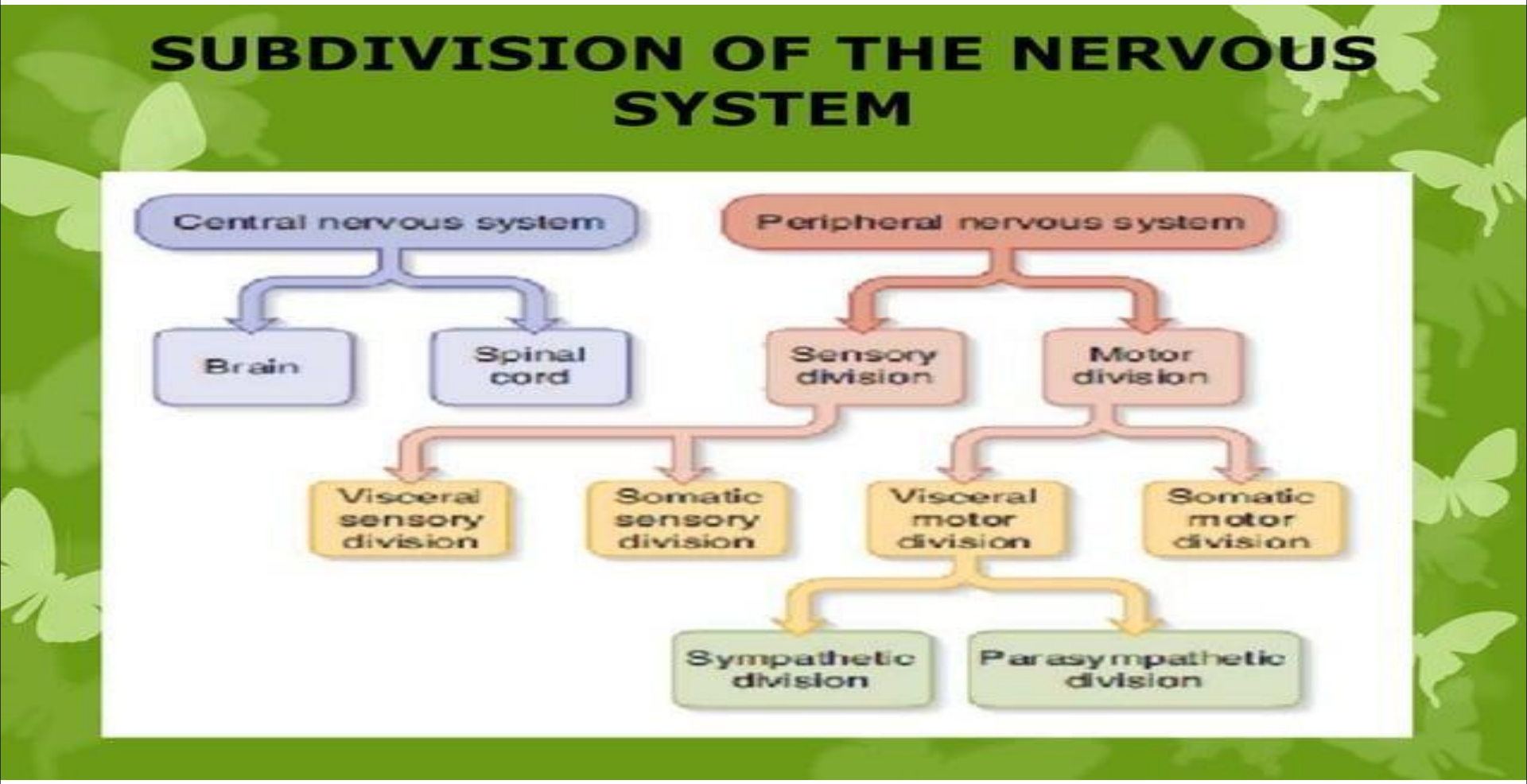
INTRODUCTION

OVERVIEW OF THE NERVOUS SYSTEM

- The nervous system has two major anatomical subdivisions;
- **The central nervous system (CNS)**
- **The peripheral nervous system (PNS)**



CLASSIFICATION



CELLS

CELLS OF THE NERVOUS SYSTEM

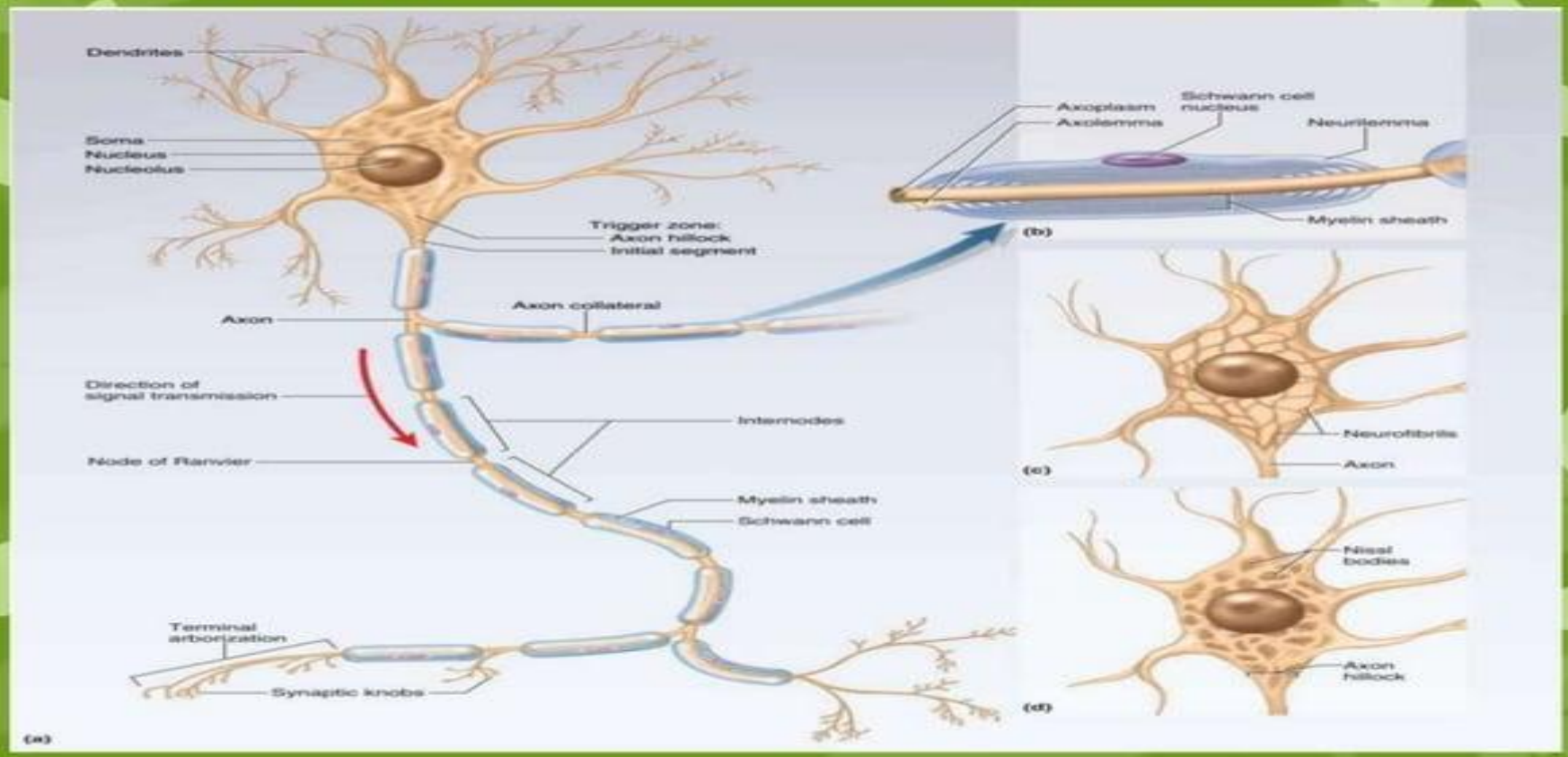
- There are two cells of the nervous system. These are;
  - ✓ **Neuron**
  - ✓ **Neuroglia**
- The functional unit of the nervous system is the nerve cell, or neuron
- Neuroglia or glial are supportive cells in the nervous system that aid the function of neurons

NEURONS

NEURONS (Nerve Cells)

- Neurons have three fundamental physiological properties:
  1. Excitability
  2. Conductivity
  3. Secretion
- A typical neuron is divided into three parts;
- ✓ **Soma or cell body (perikaryon)**
- ✓ **Dendrites**
- ✓ **Axon**

STRUCTURE


STRUCTURE OF A NEURON
Dendrites
Soma
Nucleus
Nucleolus
Trigger zone:
Axon hillock
Initial segment
Axon
Axon collateral
Direction of signal transmission
Internodes
Node of Ranvier
Myelin sheath
Schwann cell
Terminal arborization
Synaptic knobs
(a)
Axoplasm
Axolemma
Schwann cell nucleus
Neurilemma
Myelin sheath
(b)
Neurofibrils
Axon
(c)
Nissl bodies
Axon hillock
(d)

CLASSIFICATION

CLASSIFICATION OF NEURONS

- Neurons may be classified according to structure or function.

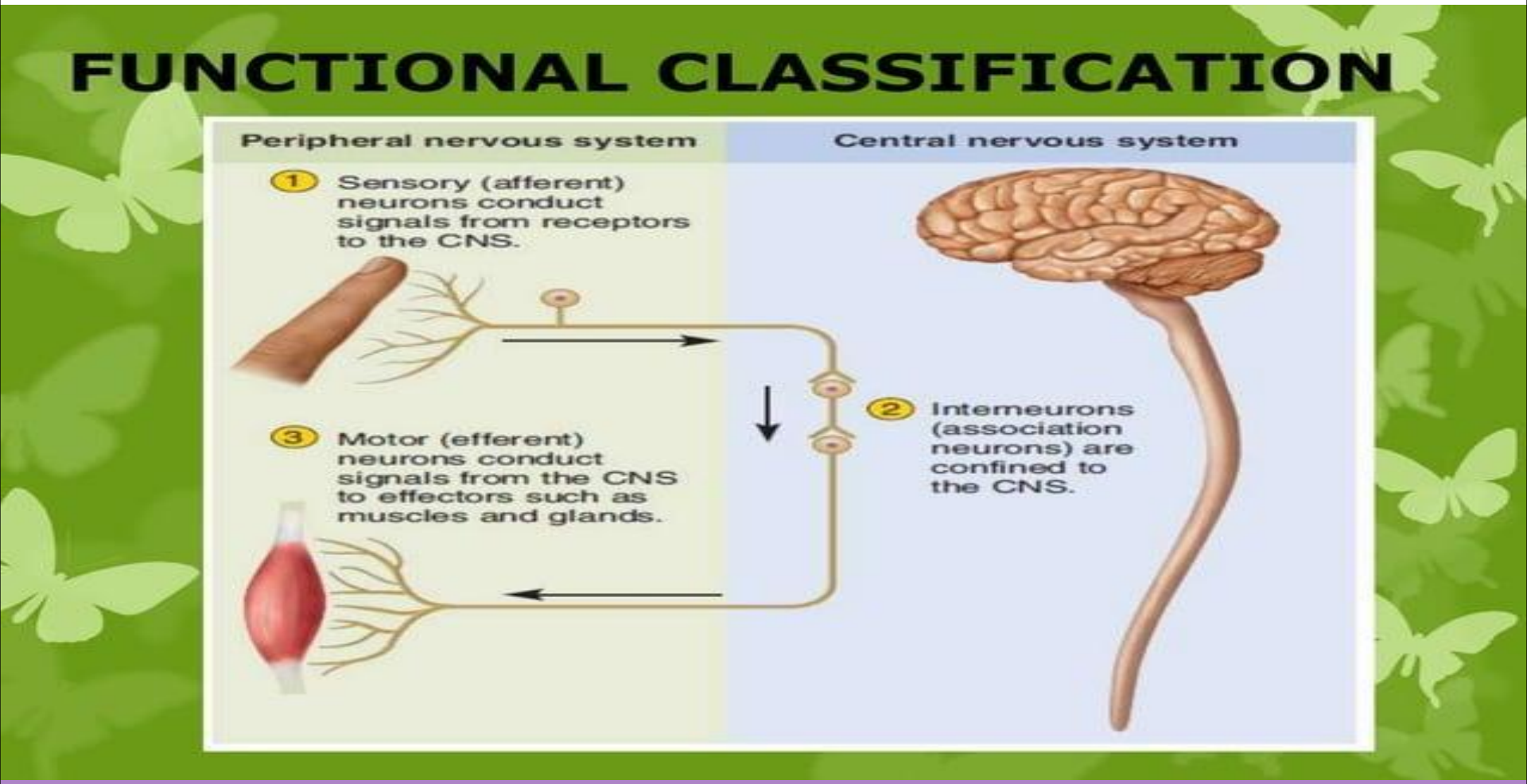
Function

- Sensory (afferent) neuron
- Interneuron (association)
- Motor neuron

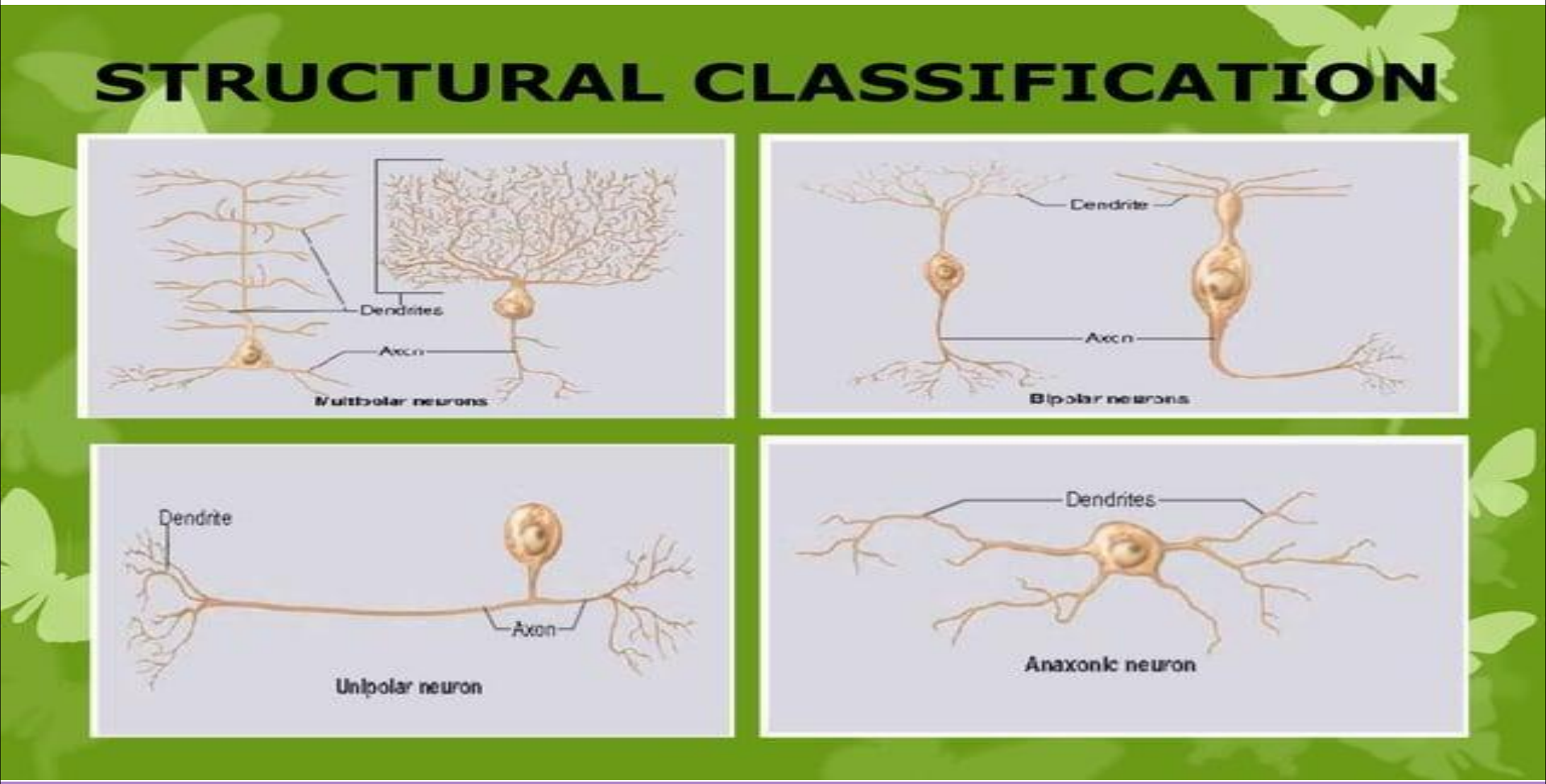
Structure

- Unipolar neurons
- Bipolar neurons
- Multipolar neurons
- Anaxonic neurons

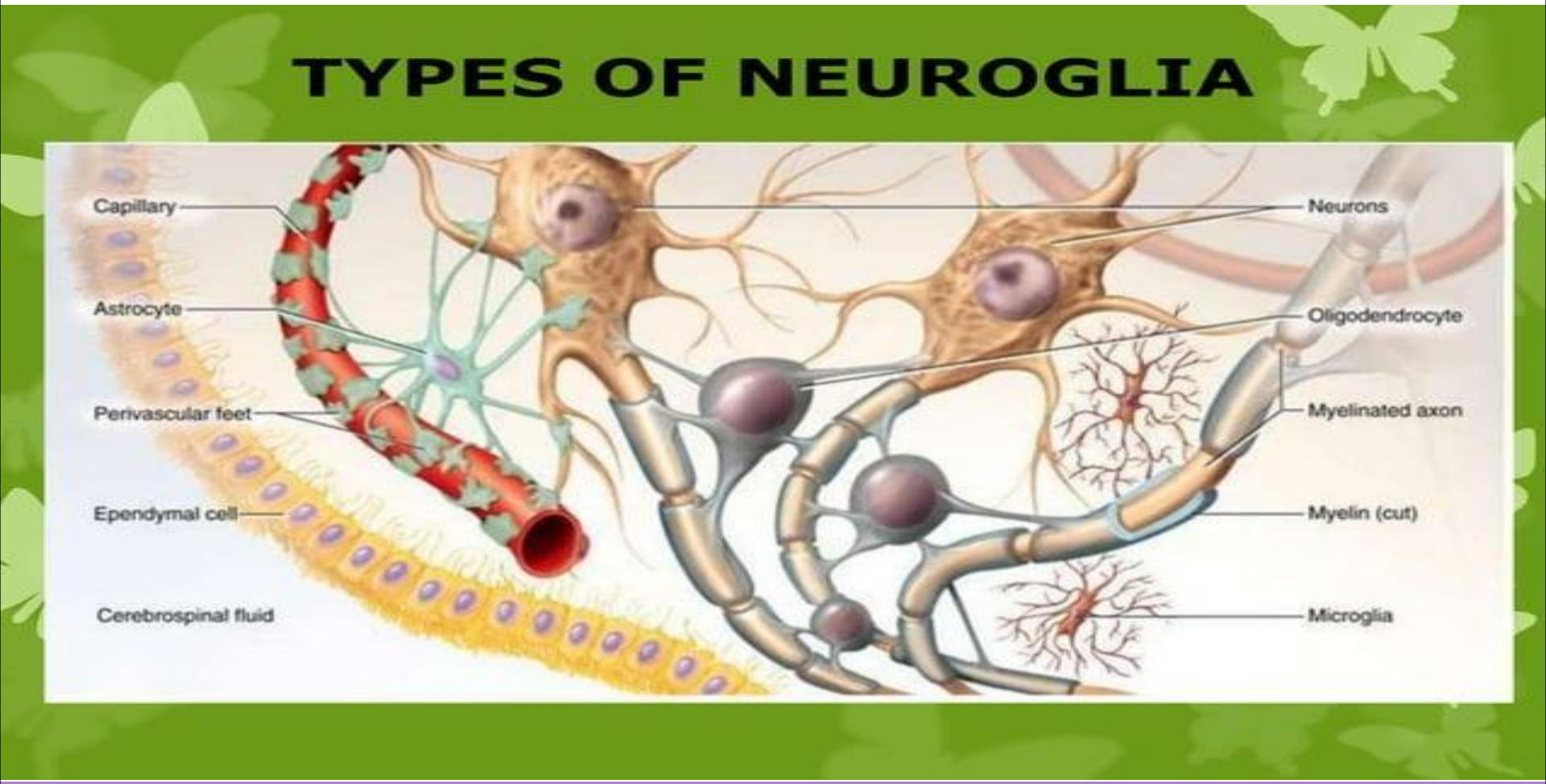
FUNCTIONAL CLASSIFICATION



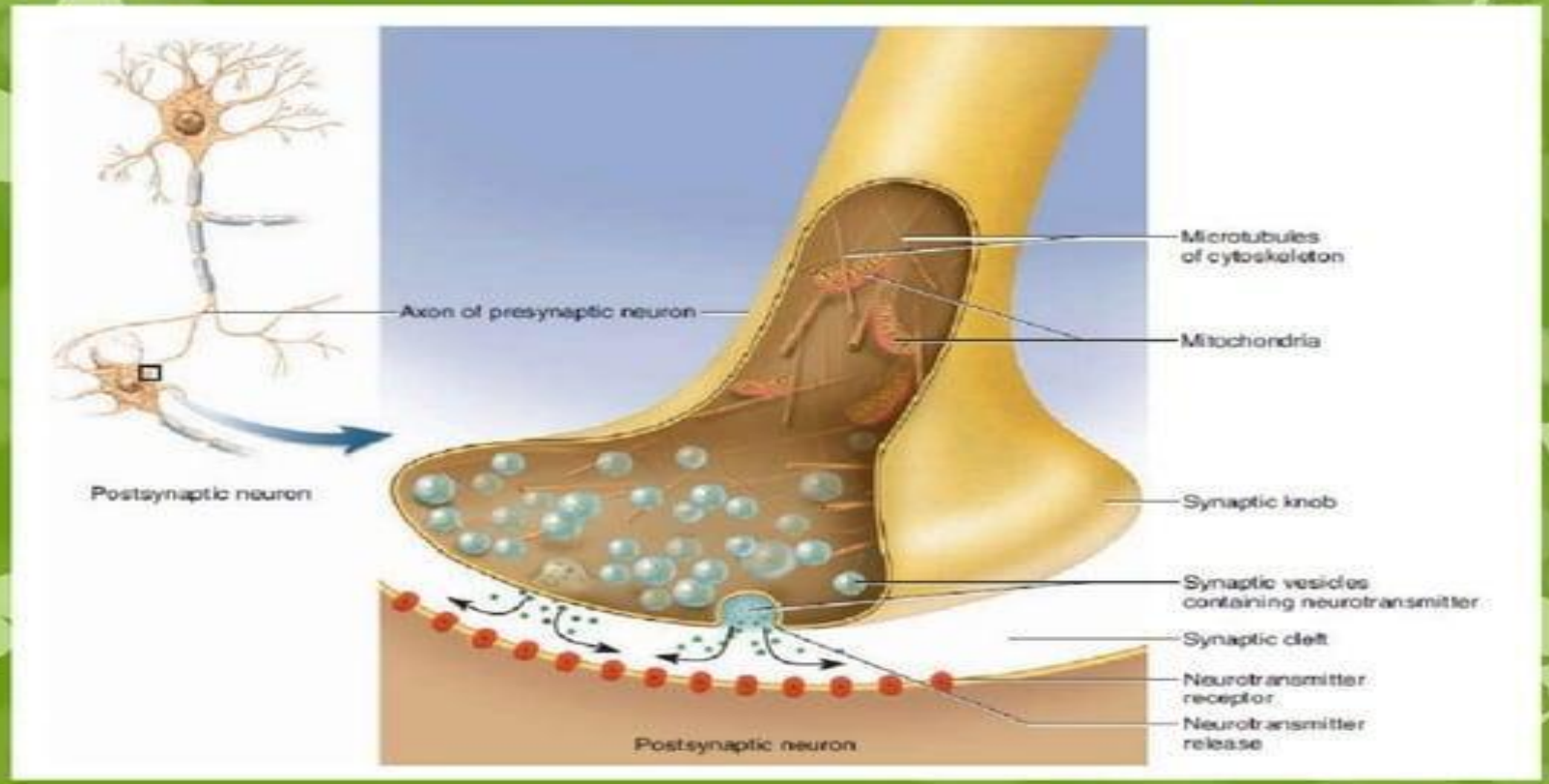
STRUCTURAL CLASSIFICATION



TYPES OF NEUROGLIA



NMJ

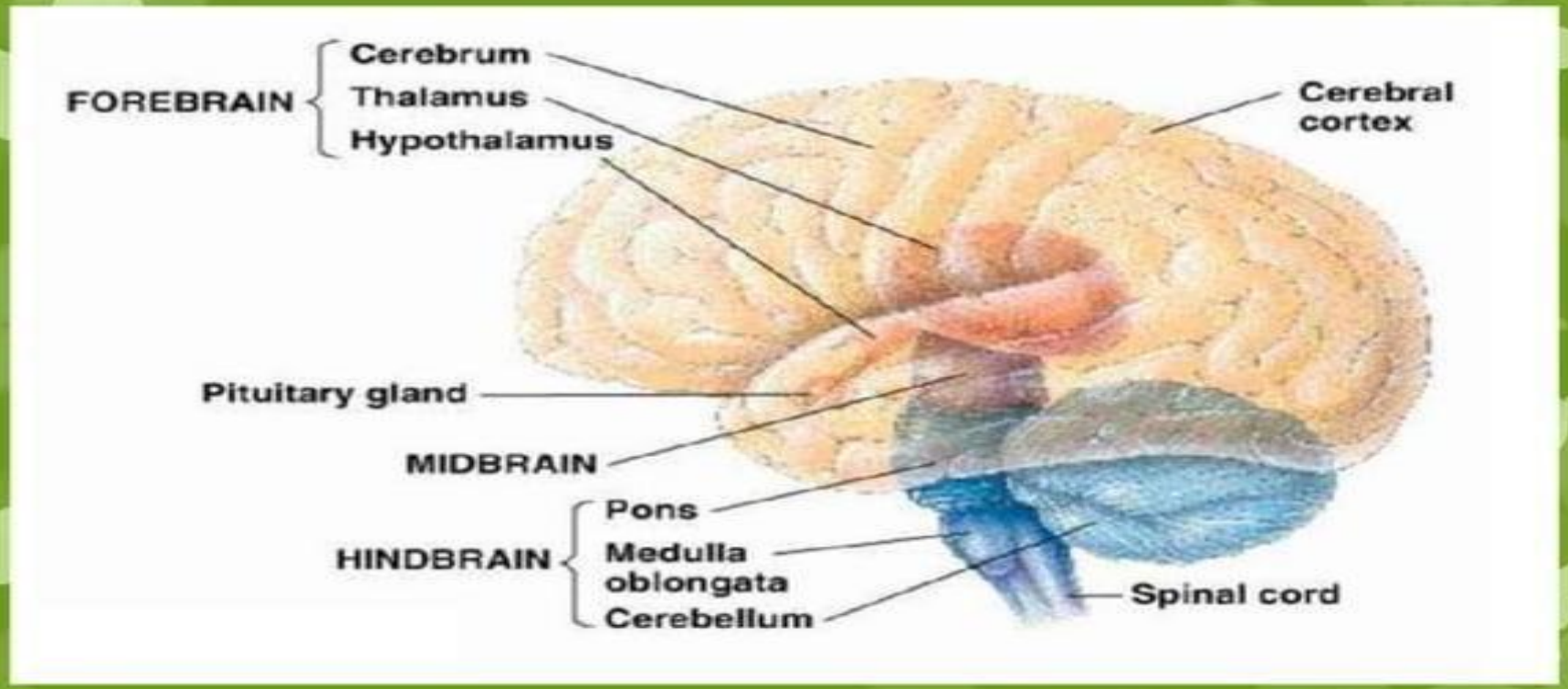

ANATOMY OF A SYNAPSE
Axon of presynaptic neuron
Postsynaptic neuron
Microtubules of cytoskeleton
Mitochondria
Synaptic knob
Synaptic vesicles containing neurotransmitter
Synaptic cleft
Neurotransmitter receptor
Neurotransmitter release
Postsynaptic neuron

CNS

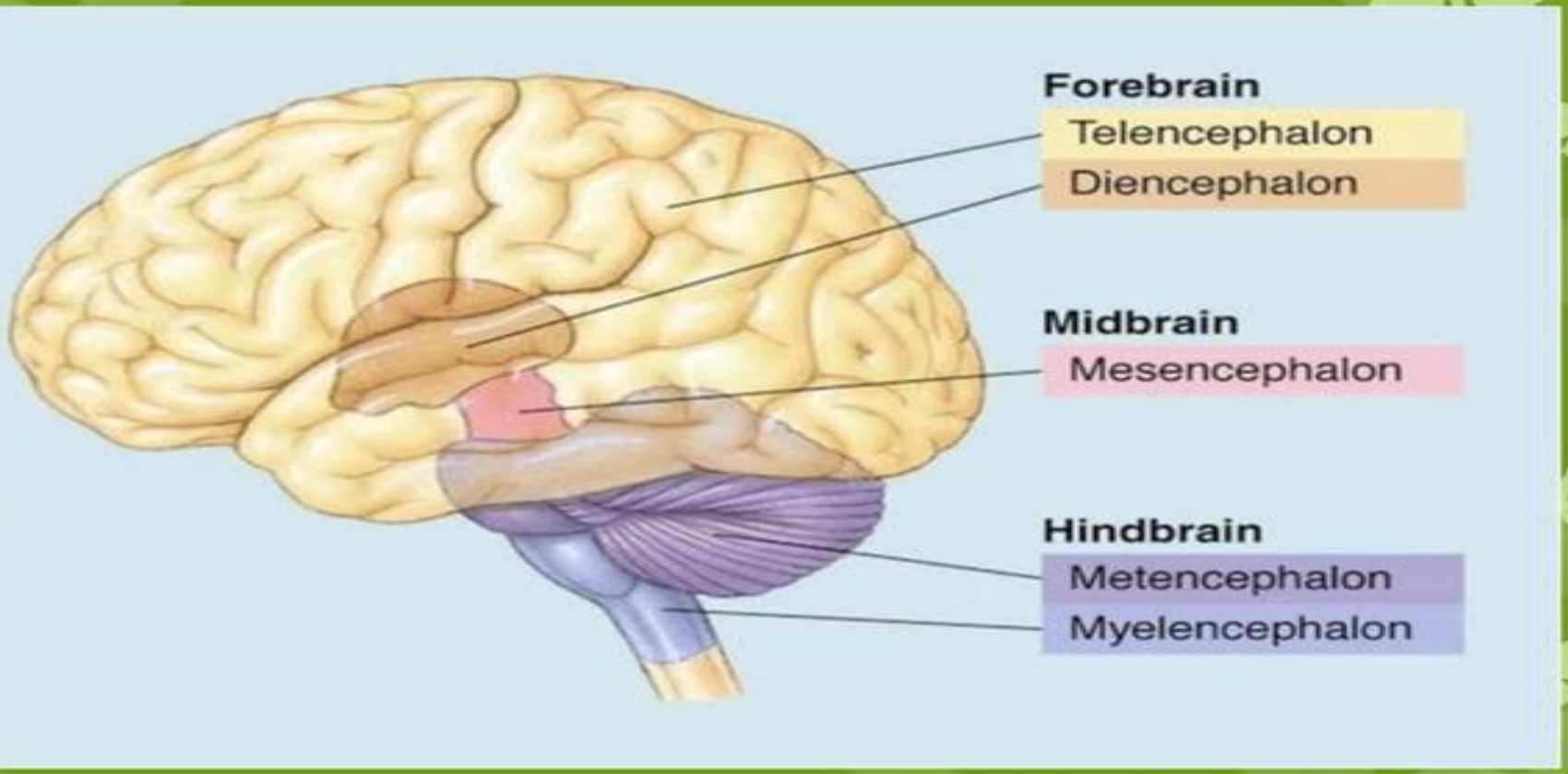
CENTRAL NERVOUS SYSTEM

- The CNS consists of the brain and spinal cord
- CNS protected by a cranium surrounding the brain
- vertebral column surrounding the spinal cord
- The CNS is bathed in cerebrospinal fluid
- The CNS is composed of gray and white matter

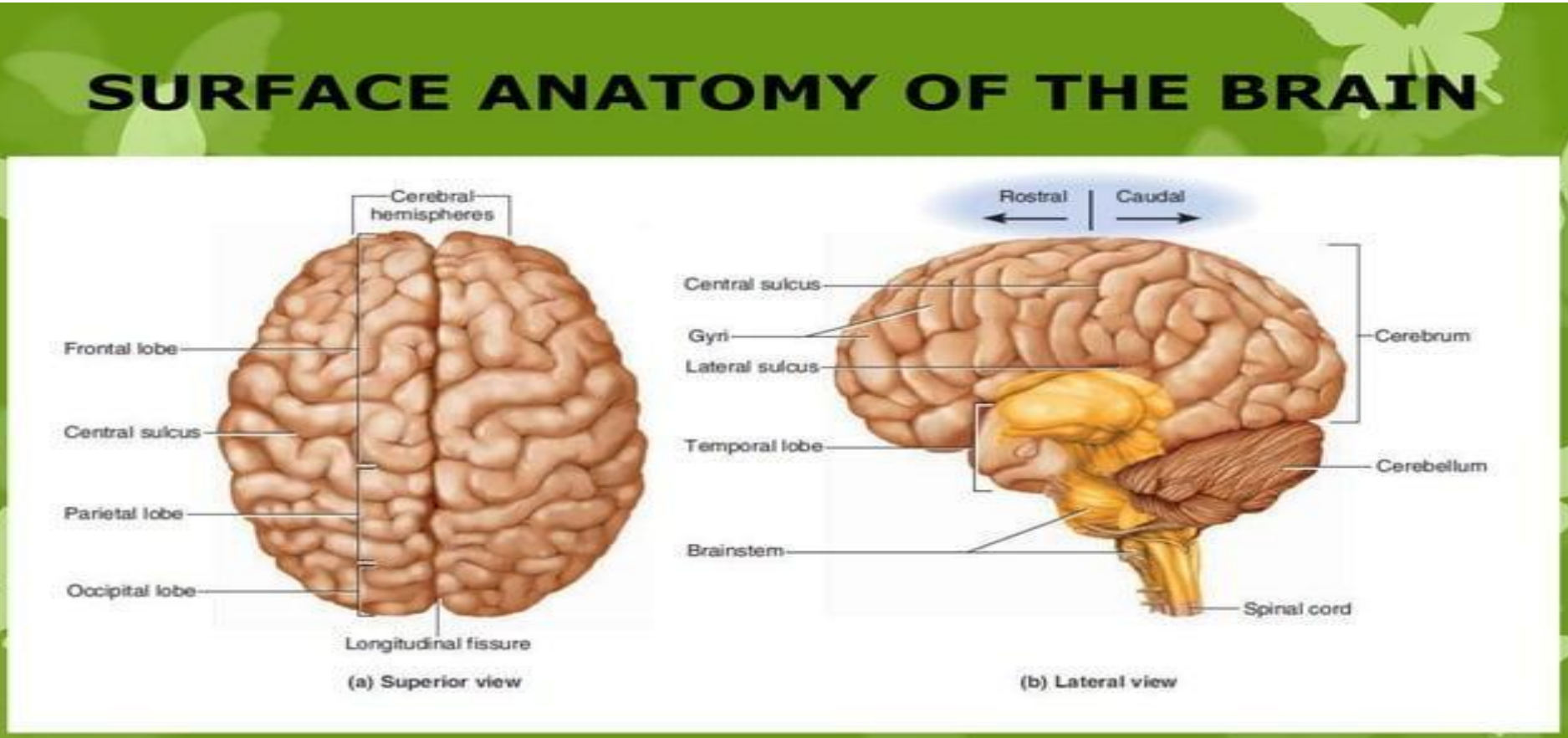
DIVISIONS OF THE BRAIN



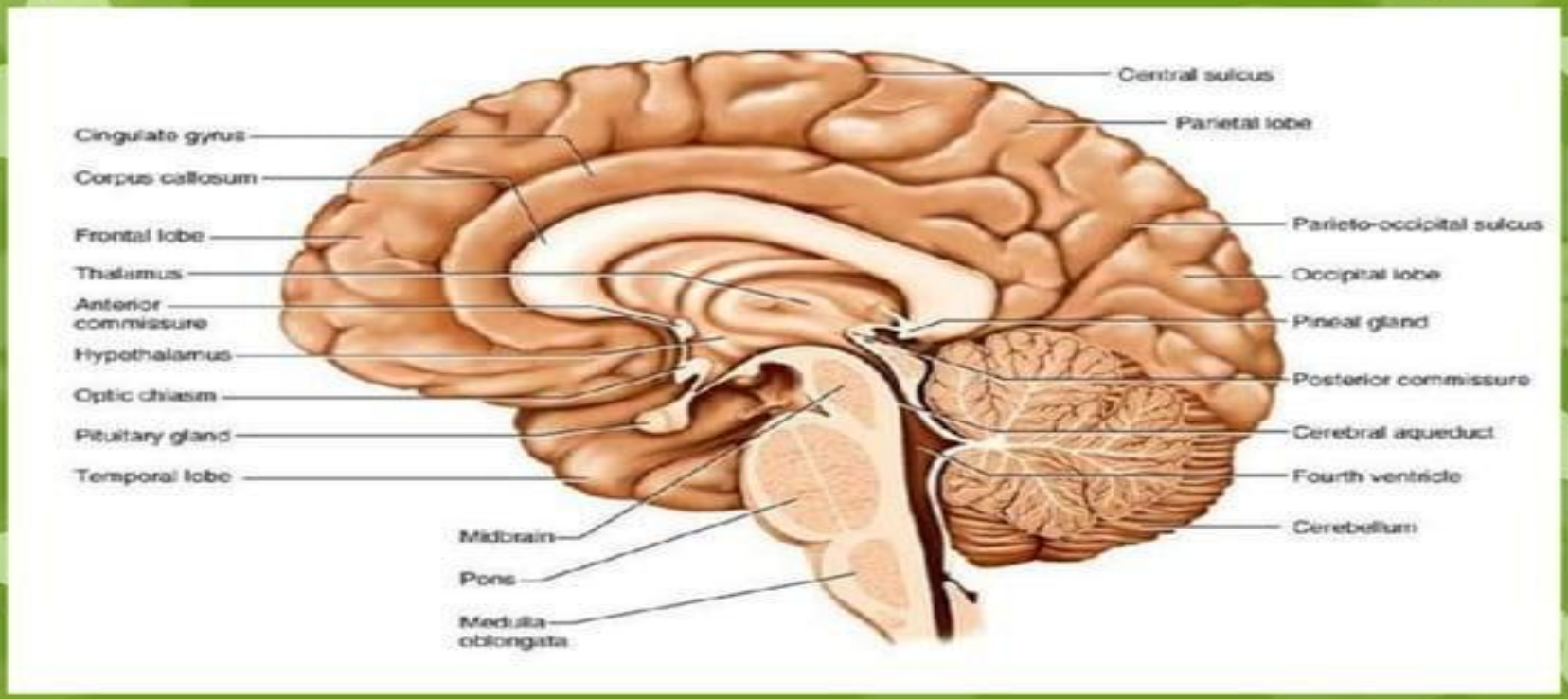
MIDBRAIN


Forebrain
Telencephalon
Diencephalon
Midbrain
Mesencephalon
Hindbrain
Metencephalon
Myelencephalon

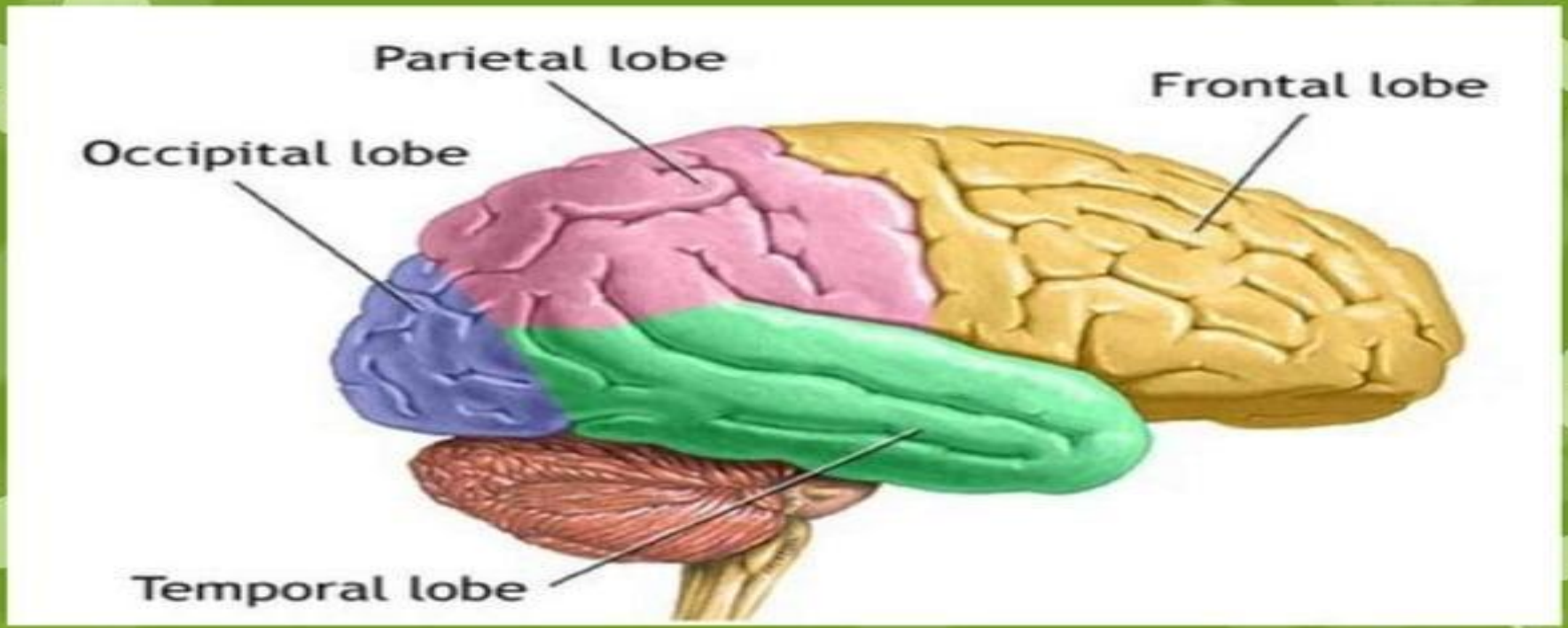
SURFACE ANATOMY OF BRAIN



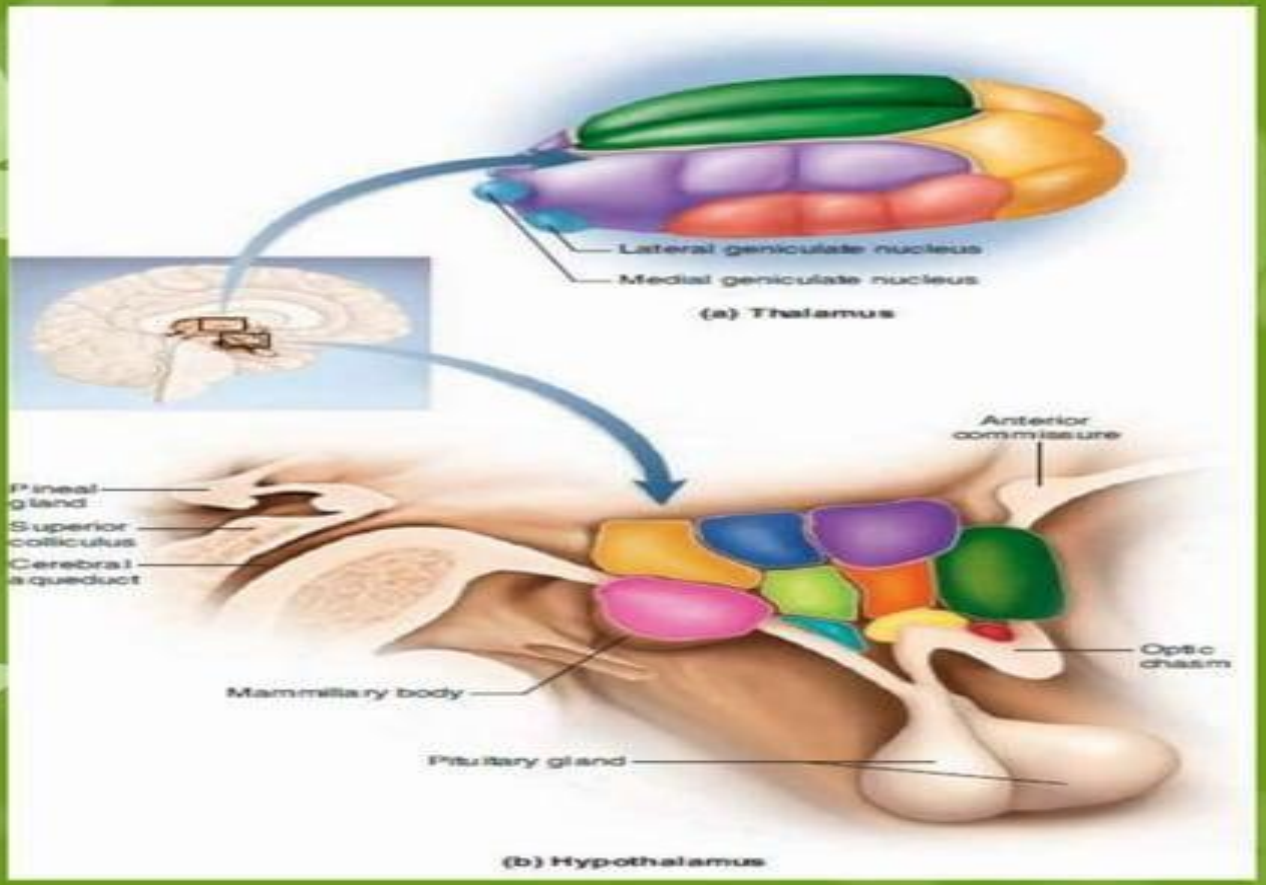
CEREBRUM


ANATOMY OF THE CEREBRUM
Central sulcus
Parietal lobe
Cingulate gyrus
Corpus callosum
Frontal lobe
Thalamus
Anterior commissure
Hypothalamus
Optic chiasm
Pituitary gland
Temporal lobe
Parieto-occipital sulcus
Occipital lobe
Pineal gland
Posterior commissure
Cerebral aqueduct
Fourth ventricle
Cerebellum
Midbrain
Pons
Medulla oblongata

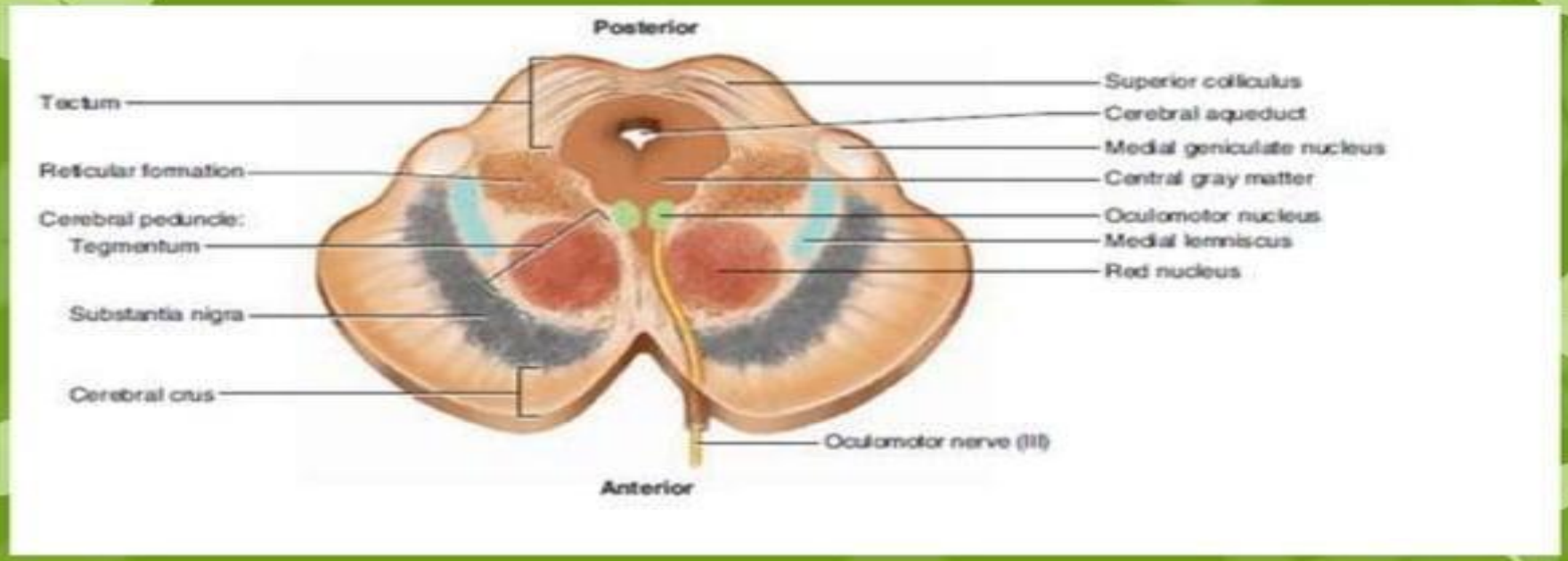
LOBES OF CEREBRUM



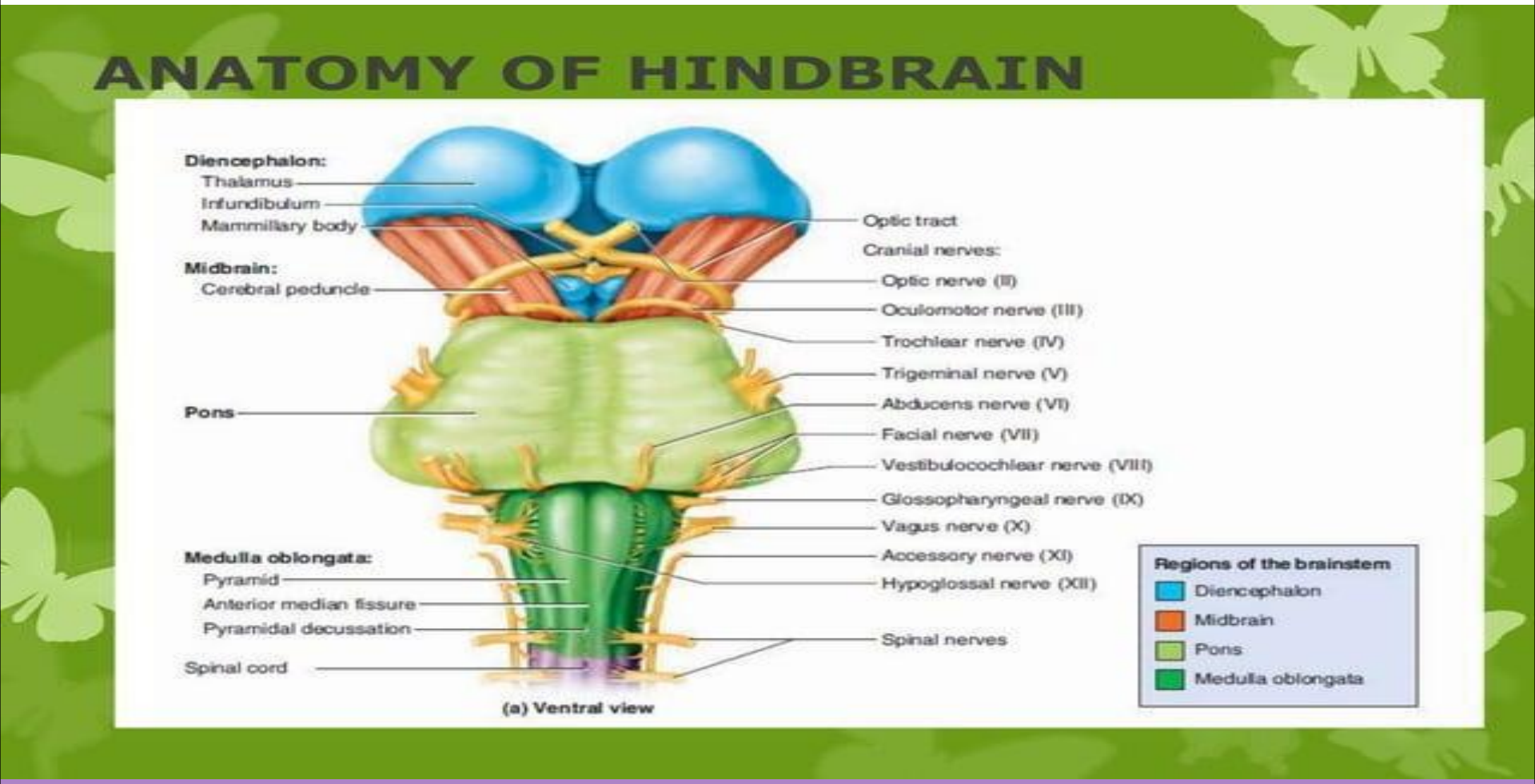
THALAMUS


Lateral geniculate nucleus
Medial geniculate nucleus
(a) Thalamus
Anterior commissure
Pineal gland
Superior colliculus
Cerebral aqueduct
Optic chiasm
Mammillary body
Pituitary gland
(b) Hypothalamus

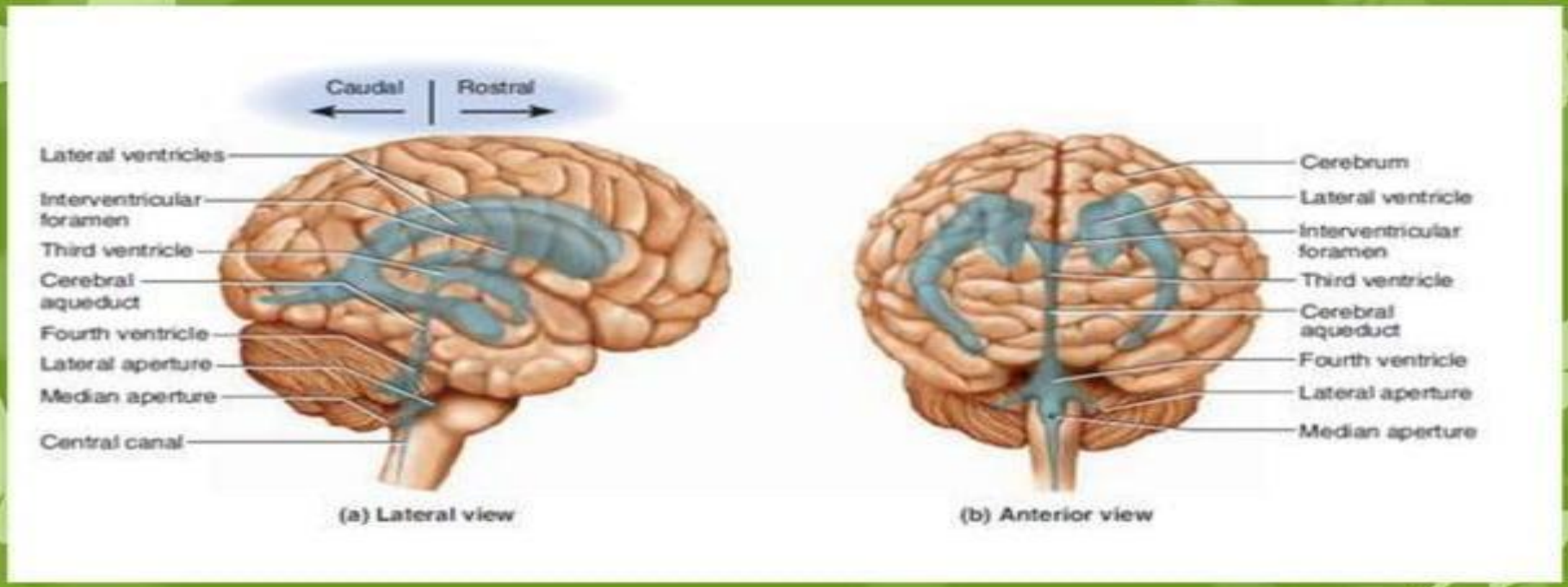
MIDBRAIN


ANATOMY OF THE MIDBRAIN
Posterior
Tectum
Reticular formation
Cerebral peduncle:
Tegmentum
Substantia nigra
Cerebral crus
Superior colliculus
Cerebral aqueduct
Medial geniculate nucleus
Central gray matter
Oculomotor nucleus
Medial lemniscus
Red nucleus
Oculomotor nerve (III)
Anterior

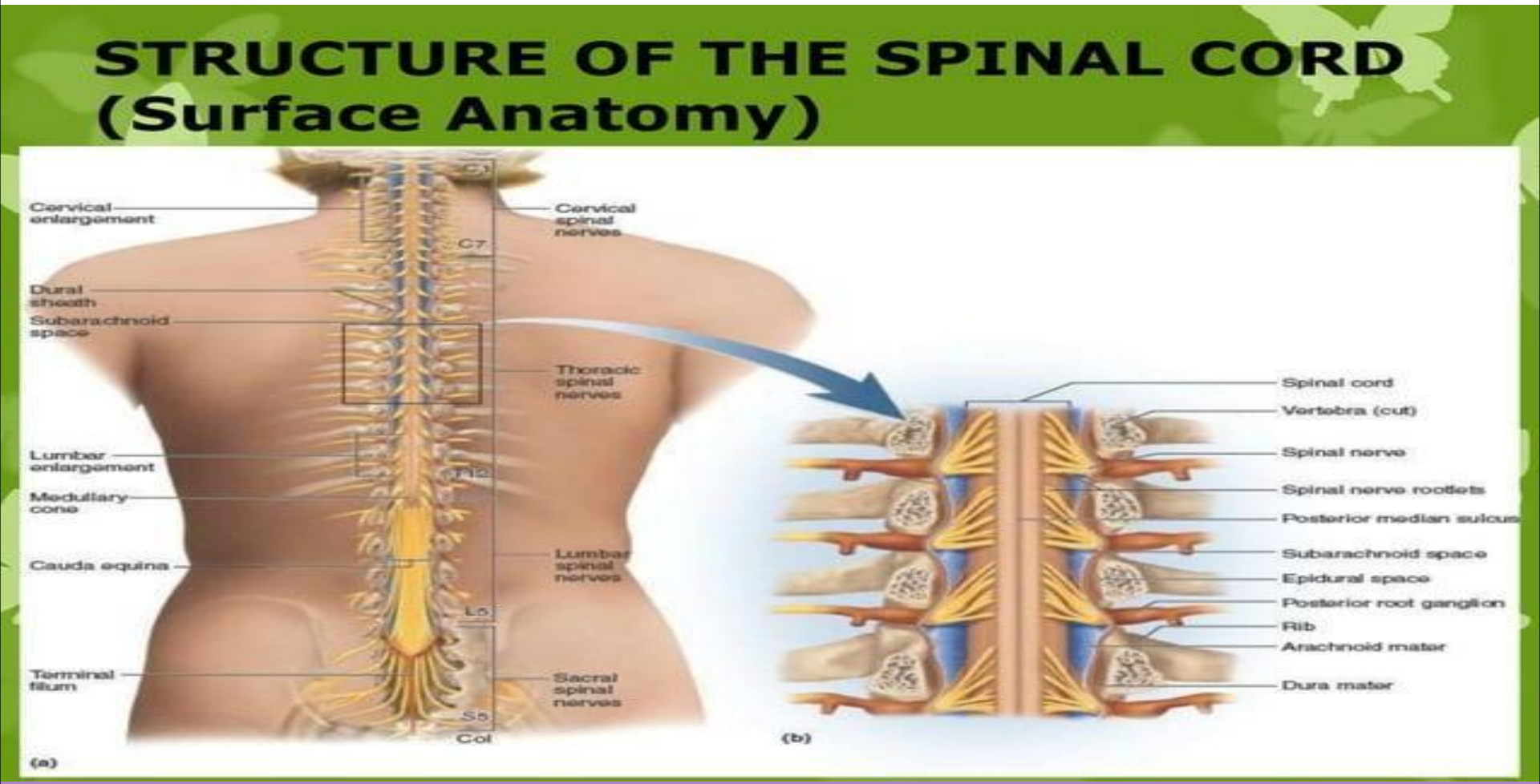
HINDBRAIN


ANATOMY OF HINDBRAIN
Diencephalon:
Thalamus
Infundibulum
Mammillary body
Midbrain:
Cerebral peduncle
Pons
Medulla oblongata:
Pyramid
Anterior median fissure
Pyramidal decussation
Spinal cord
Optic tract
Cranial nerves:
Optic nerve (II)
Oculomotor nerve (III)
Trochlear nerve (IV)
Trigeminal nerve (V)
Abducens nerve (VI)
Facial nerve (VII)
Vestibulocochlear nerve (VIII)
Glossopharyngeal nerve (IX)
Vagus nerve (X)
Accessory nerve (XI)
Hypoglossal nerve (XII)
Spinal nerves
Regions of the brainstem
Diencephalon
Midbrain
Pons
Medulla oblongata
(a) Ventral view

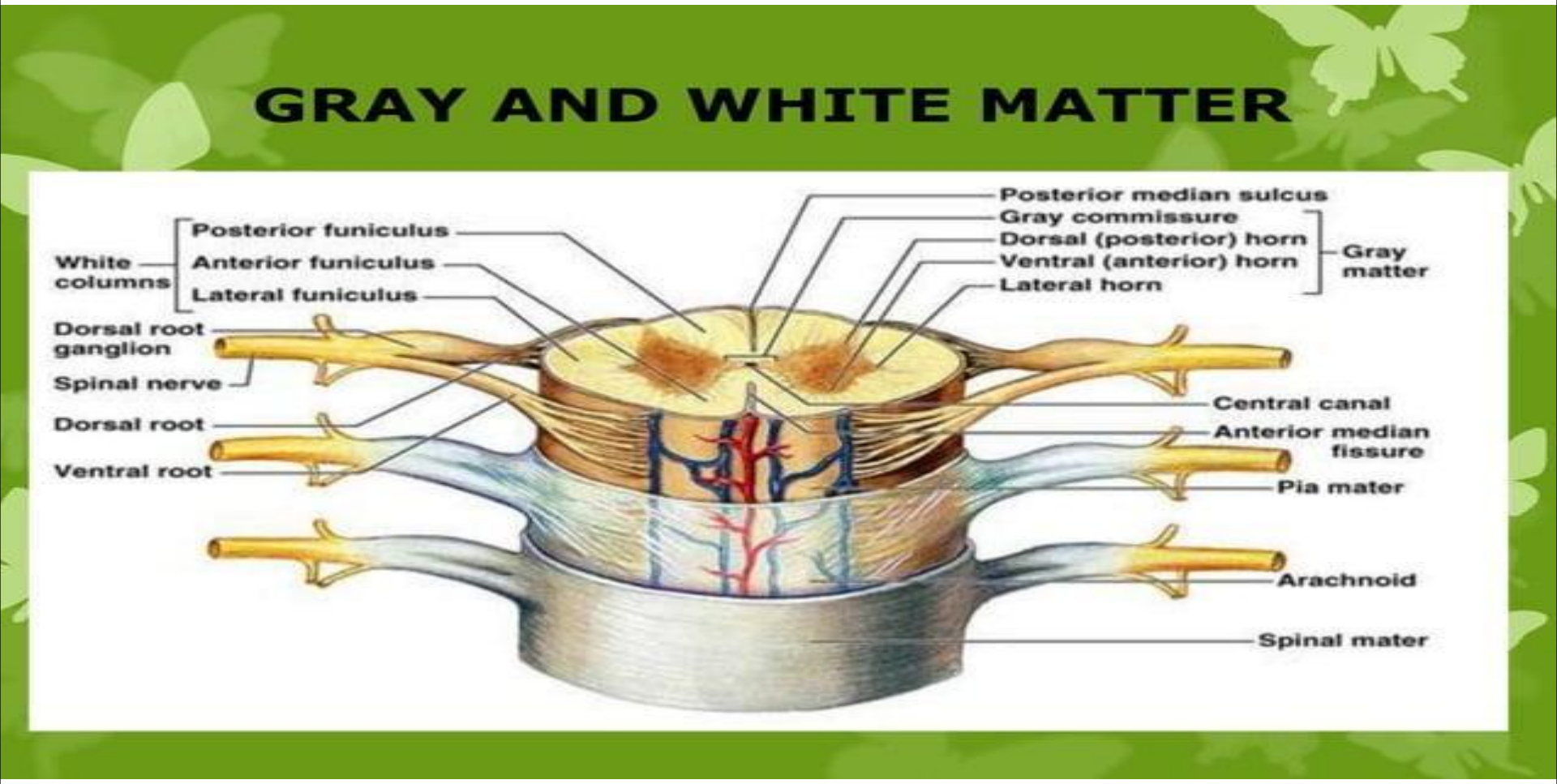
VENTRICLES OF THE BRAIN



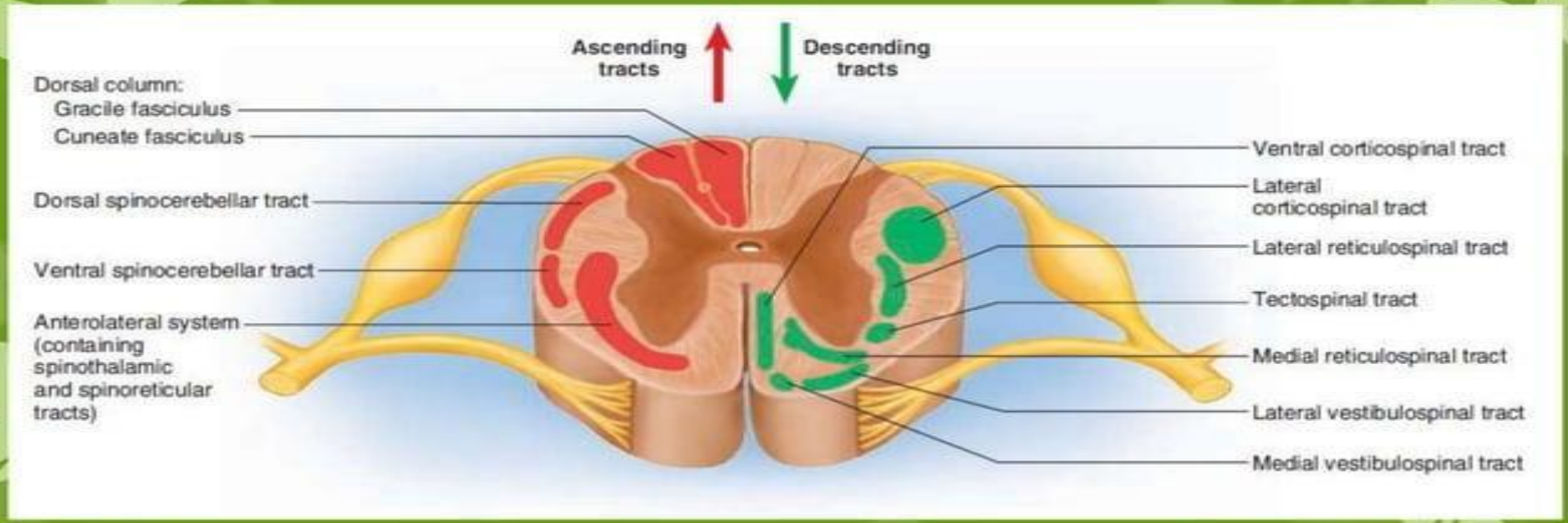
SPINALCORD


STRUCTURE OF THE SPINAL CORD
(Surface Anatomy)
Cervical enlargement
Dural sheath
Subarachnoid space
Lumbar enlargement
Medullary cone
Cauda equina
Terminal filum
Cervical spinal nerves
Thoracic spinal nerves
Lumbar spinal nerves
Sacral spinal nerves
C1
C7
T1
T12
L1
L5
S5
Col
(a)
Spinal cord
Vertebra (cut)
Spinal nerve
Spinal nerve rootlets
Posterior median sulcus
Subarachnoid space
Epidural space
Posterior root ganglion
Rib
Arachnoid mater
Dura mater
(b)

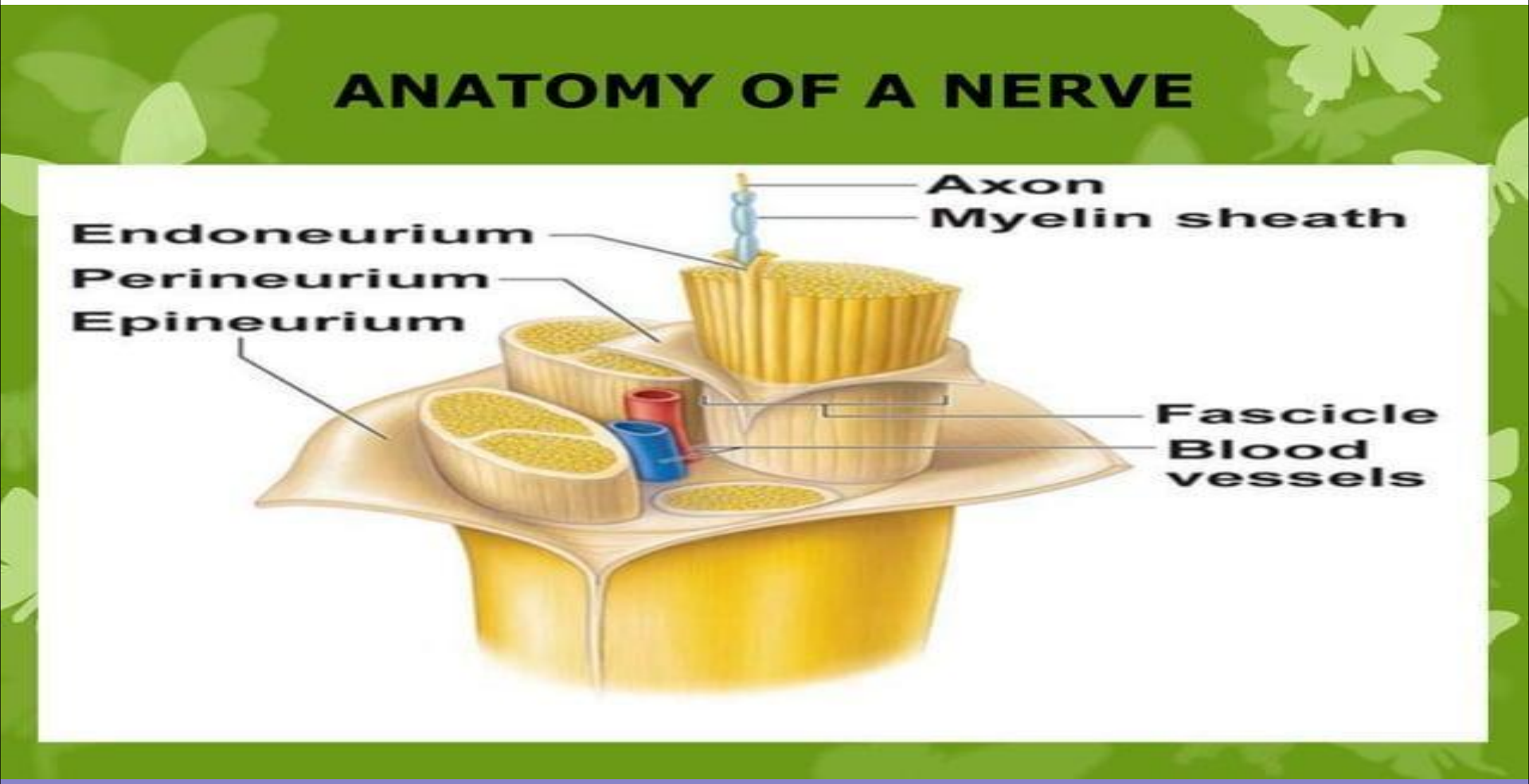
SPINALCORD


GRAY AND WHITE MATTER
Posterior median sulcus
Gray commissure
Dorsal (posterior) horn
Ventral (anterior) horn
Lateral horn
Gray matter
Posterior funiculus
Anterior funiculus
Lateral funiculus
White columns
Dorsal root ganglion
Spinal nerve
Dorsal root
Ventral root
Central canal
Anterior median fissure
Pia mater
Arachnoid
Spinal mater

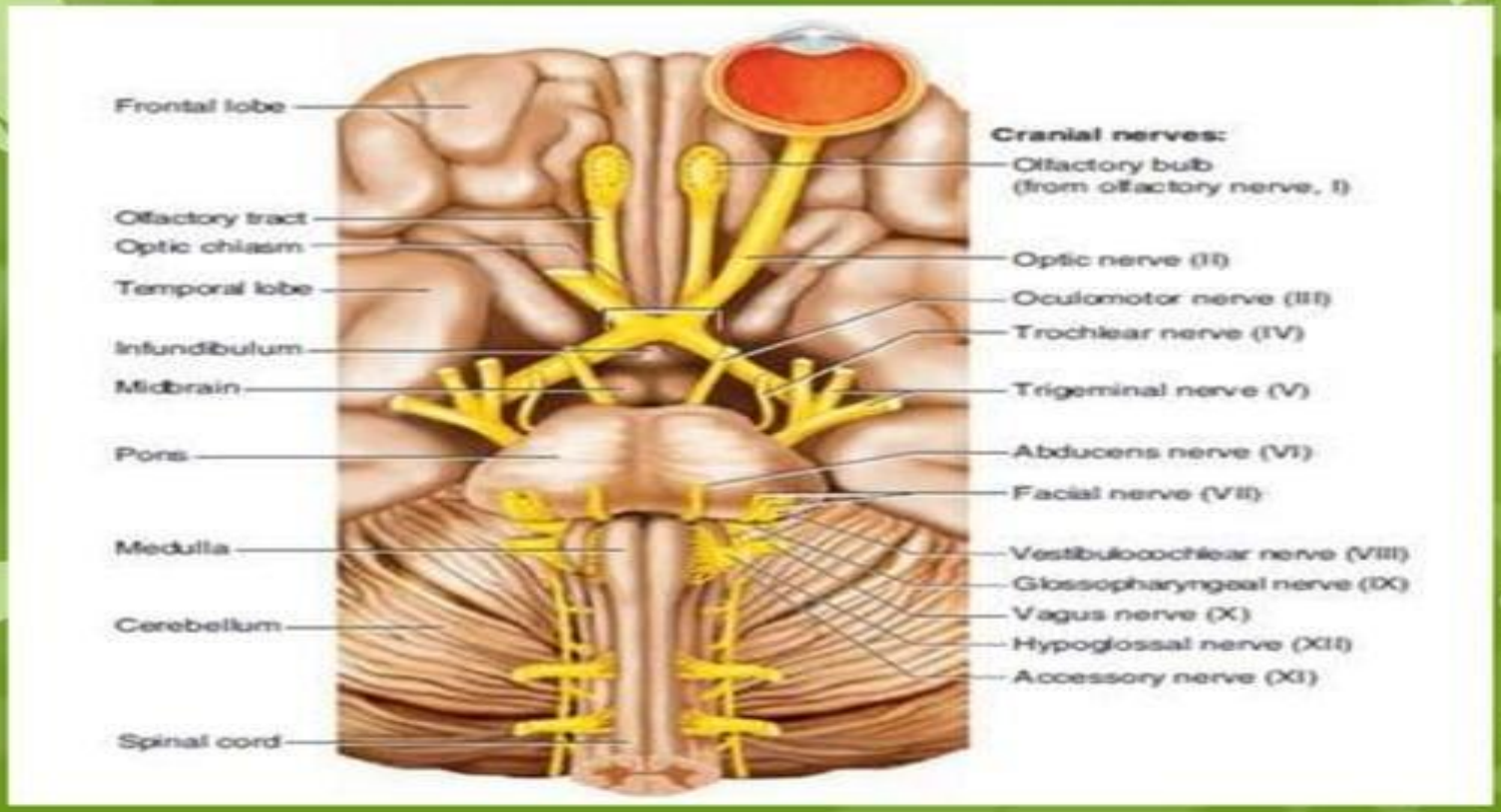
TRACTS OF SPINALCORD



NERVE


ANATOMY OF A NERVE
Axon
Myelin sheath
Endoneurium
Perineurium
Epineurium
Fascicle
Blood vessels

CRANIAL NERVES

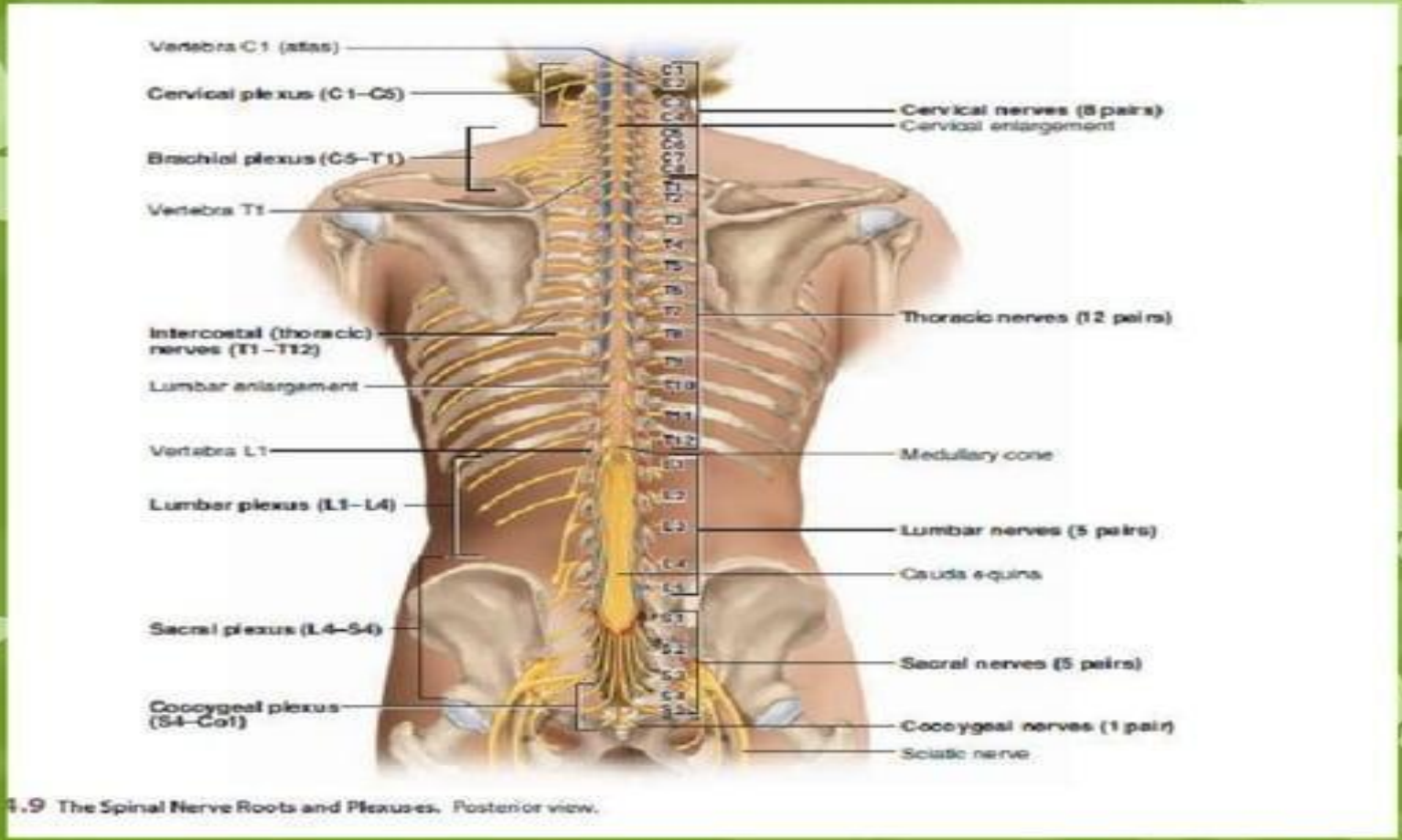


FUNCTIONS

FUNCTIONS OF CRANIAL NERVES

Number	Name	Function
I	Olfactory	Sense of smell
II	Optic	Vision
III	Oculomotor	Motor control of some eye muscles and eyelid
IV	Trochlear	Motor control of some eye muscles
V	Trigeminal	Chewing muscles and some facial sensation
VI	Abducent	Motor control of some eye muscles
VII	Facial	Motor control of facial muscles, salivation. Taste and cutaneous sensations.
VIII	Acoustic	Equilibration, static sense and hearing
IX	Glossopharyngeal	Salivation, sensations of skin, taste and viscera
X	Vagus	Motor control of the heart and viscera, sensation from the thorax, pharynx and abdominal viscera
XI	Accessory	Motor impulses to the pharynx and shoulder
XII	Hypoglossal	Motor control of the tongue, some skeletal muscles, some viscera, sensation from skin and viscera

SPINALNERVES



4.9 The Spinal Nerve Roots and Plexuses. Posterior view.

IN CLASS ASSESSMENT

1. Identify the labeled parts of a neuron
   a) Dendrite
   b) Axon
   c) Node of Ranvier
   d) Schwann cell
   e) Axon hillock

2. Functional classification of neurons includes:
   a) Bipolar
   b) Sensory
   c) Pseudounipolar
   d) Multipolar

IN CLASS ASSESSMENT

Neuroglia that forms myelin in CNS:
a) Schwann cell
b) Astrocyte
c) Oligodendrocyte
d) Microglia

Case-Based Mini Scenario (Clinical Orientation – 5 marks)

Case:
A patient presents with loss of voluntary muscle control but intact sensation.

Question:

Which type of neuron is affected?

Is it sensory or motor?

Rapid Fire Oral Questions

How many cranial nerves are there?

Define synapse

What is NMJ?

Name one function of thalamus

Exit Ticket (Before Leaving Class)

Question:

Write one difference between **cranial nerves** and **spinal nerves**.

THANK YOU FOR YOUR KIND ATTENTION