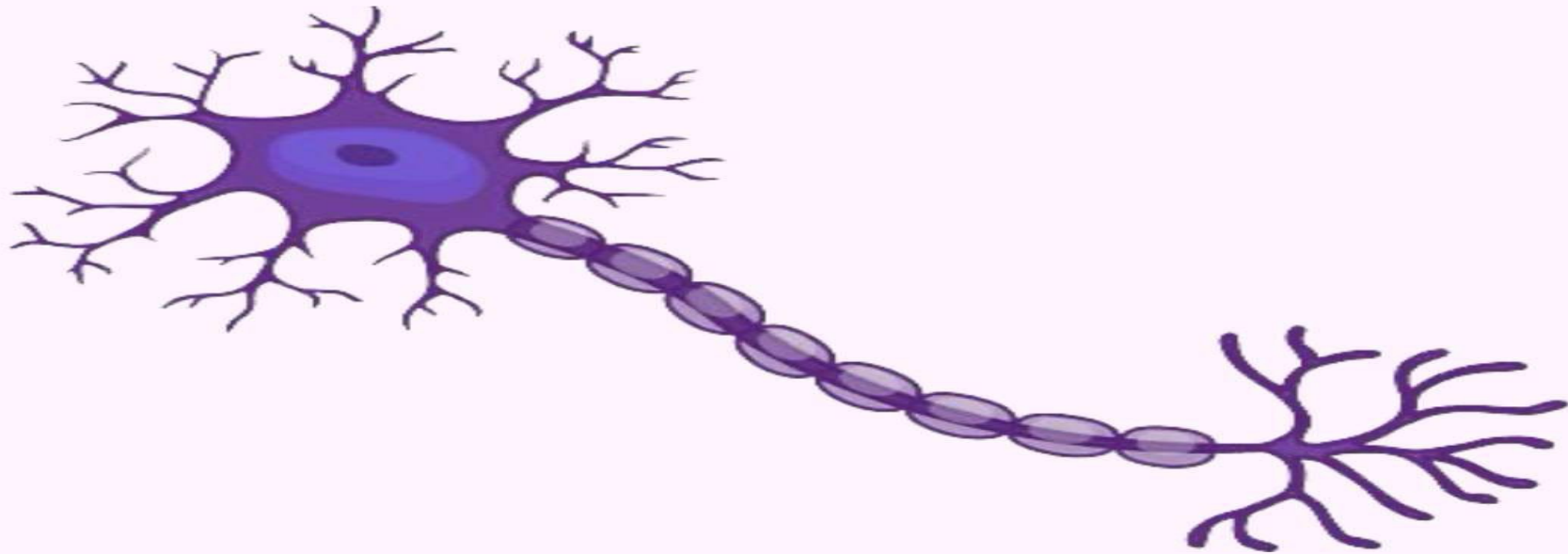




PHYSIOLOGY



LEC NO. : 5
DONE BY : Amir f

وَقُلْ رَبِّ زِدْنِي عِلْمًا

Autonomic Nervous System

→ rapidly response

The nervous system is the major control system in the body which regulates **many body functions** necessary for life.

organ
tissue
cell

Nerve Cell (Neuron)

- It is **the structural unit** of nervous system.

Structure:

It is formed of:

- a) **Cell body (soma): controls the activity of the whole neuron.**
- b) **Cell processes: 2 types axis and dendrites**

Endocrine → slow response

The axon near its termination either joins:

- Muscle → neuromuscular junction.
- Gland → neuroepithelial junction.
- Dendrites or soma of another neuron → neuro-neural junction.

c) Types

- Afferent (sensory) neuron** → carries impulses **from receptors to CNS.** → central nervous system
- Efferent (motor) neuron** → carries impulses from CNS to effector organs. → like muscle
- Interneuron (associative)** → located **entirely within CNS.**

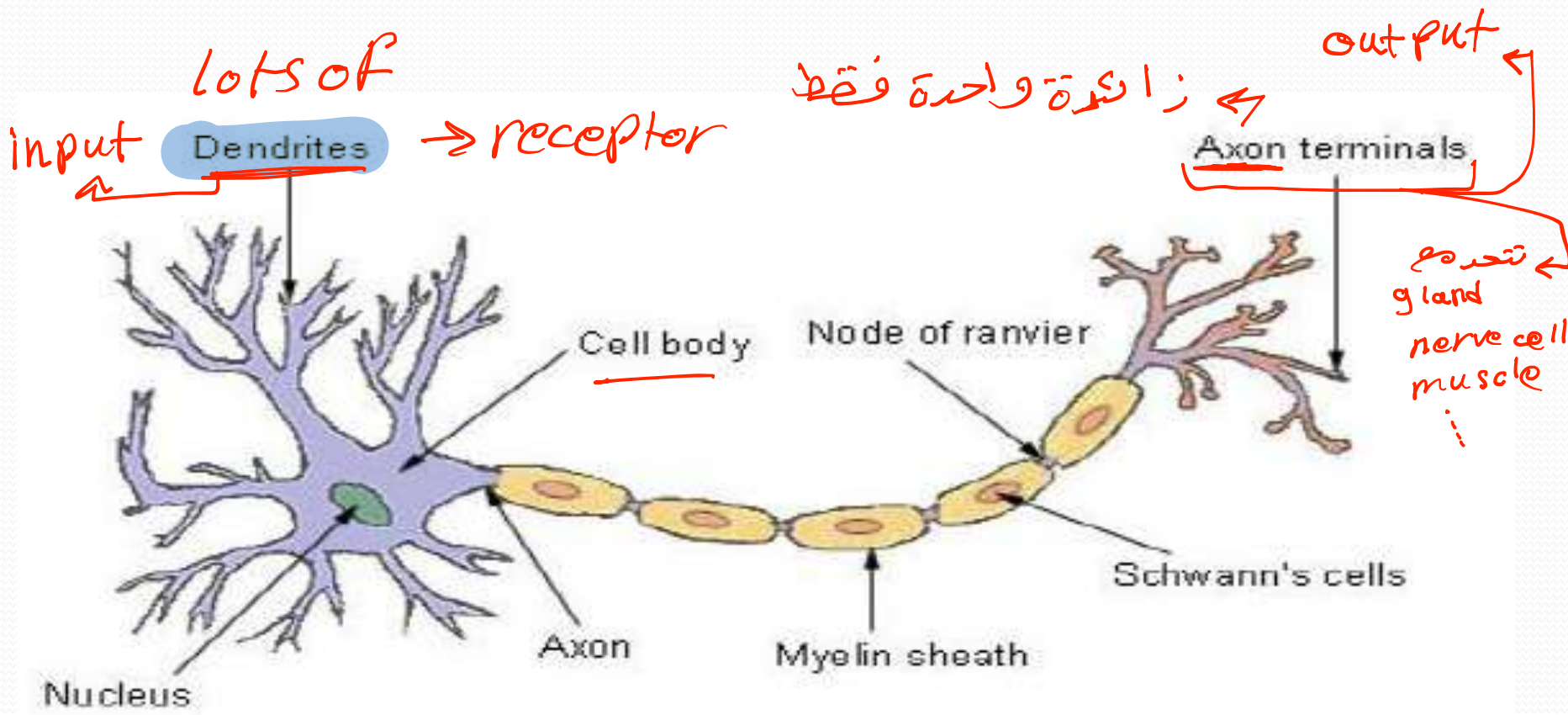


Fig. (9): Structure of neuron

Definition

Reflex Action

- It is an involuntary reaction of the body to sensory stimulus

لے تعلقاتی

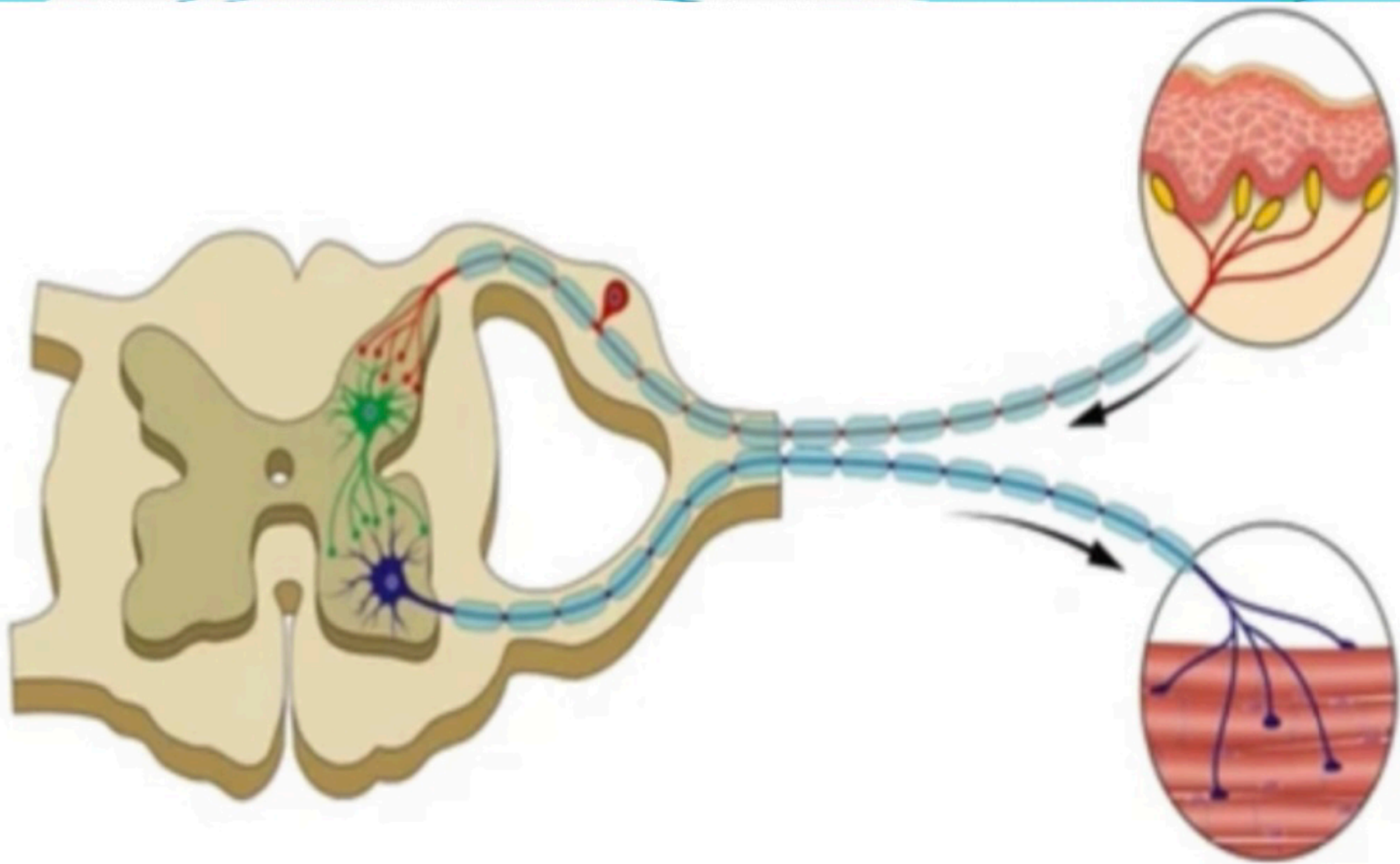
التحفيز الحسي

Pathway (reflex arc):

- It is carried out through pathway called reflex arc which is considered the functional or physiological unit of the nervous system

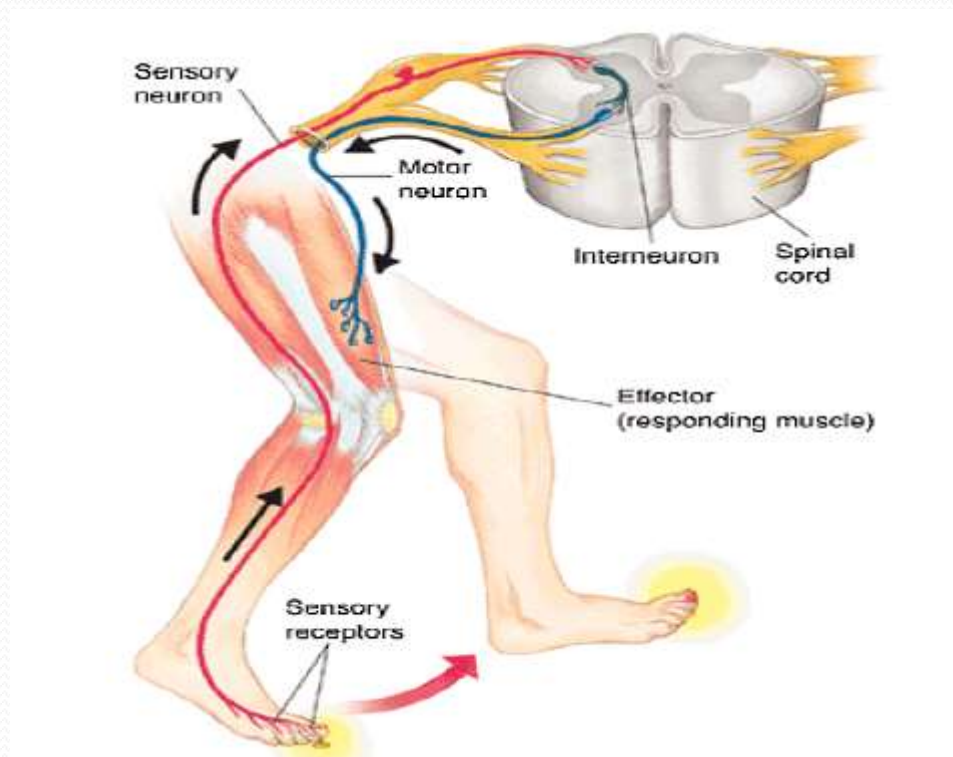
Components of reflex arc are:

- i- Receptors.
- ii- Afferent (sensory) neuron
- iii- Center (in CNS).
- iv. Efferent (motor) neuron
- v. Effectors (muscles or glands).



Types:

- i) **Somatic reflex; e.g. flexion withdrawal reflex.**
- ii) **Autonomic reflex; e.g. micturition reflex.**



Reflex arc (flexion withdrawal reflex)

Divisions of Nervous System

The nervous system is divided into:

- i) **Central nervous system (CNS).**
- ii) **Peripheral nervous system (PNS).**

ای تعلق طے اسی حسب
طے NS کے لایسے تھویضے

Central Nervous System (CNS)

→ brain
→ spinal cord

It is the part of the NS which is **protected by bone (skull and vertebral column).**

Parts:

It consists of 2 parts;

1) Brain

- **It is located in the skull**
- It consists of 3 parts;

I. Cerebrum (2 cerebral hemispheres); consists of;

- Cerebral cortex

مركز الاحساس → قشرة

- Subcortical centers: include الدماغ تحت القشرة

1- Thalamus 2- Hypothalamus 3- Basal ganglia.

لها دورها
الحركية ←

لها دورها

لها القشرة القاعدية

II. Brain stem: consists of;

1. Midbrain

2. Pons

3. Medulla oblongata.

i- Cerebellum.

لها دورها
الجسدي

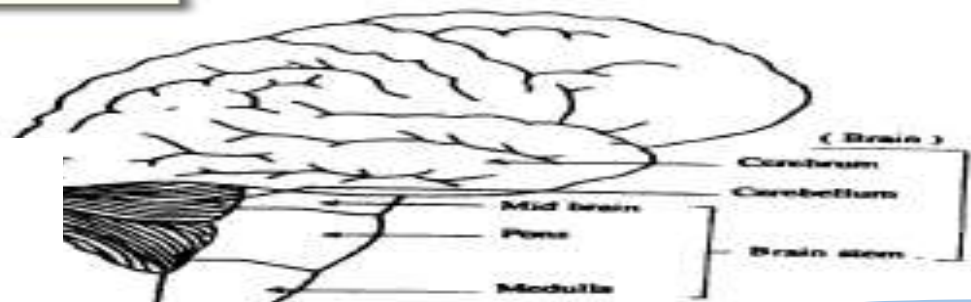
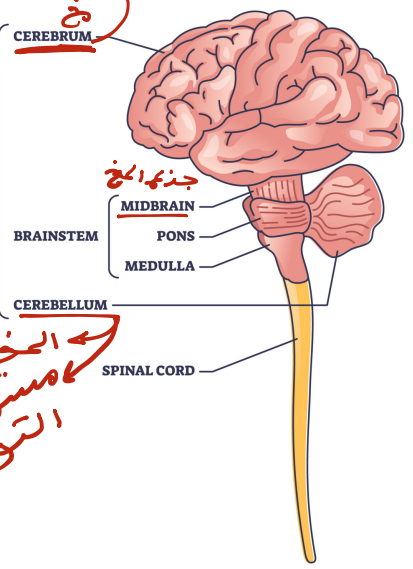
2) Spinal cord:

- **It is located in the spine (vertebral column**
- It is subdivided into 31 segments; **8 cervical segments, 12 thoracic segments, 5 lumbar segments, 5 sacral segments and one coccygeal segment.**
- The spinal cord consists of 2 parts:
 1. **Outer white matter: anterior, posterior and lateral column**
 2. **Inner gray matter: anterior, posterior and lateral horns**
↳ no lipid layer

CENTRAL NERVOUS SYSTEM

one on the left and one on the right

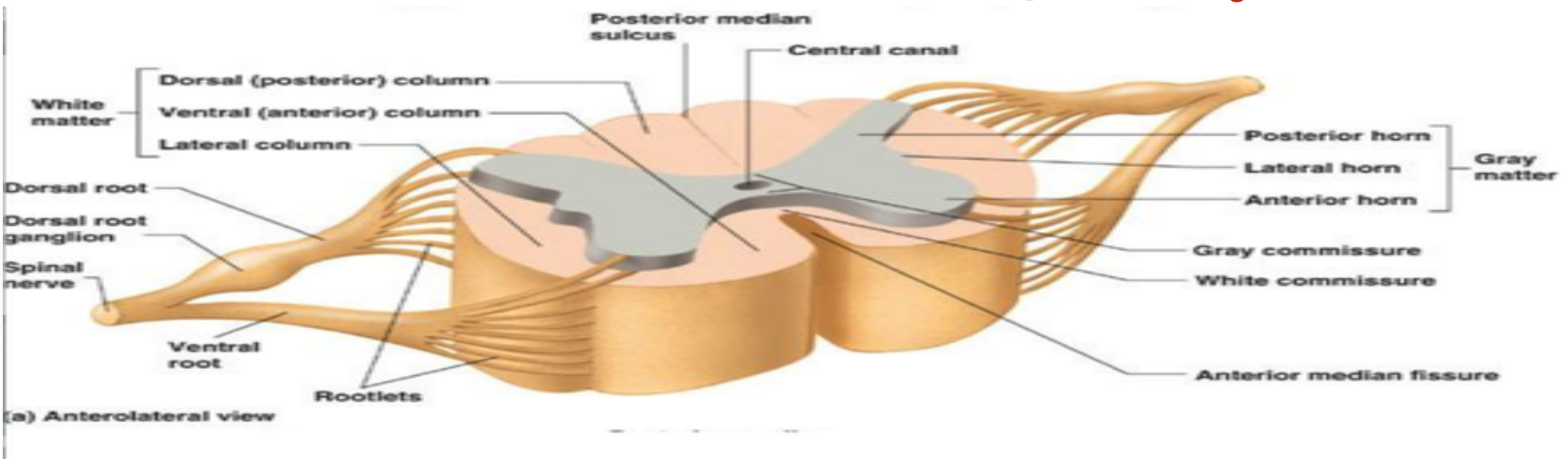
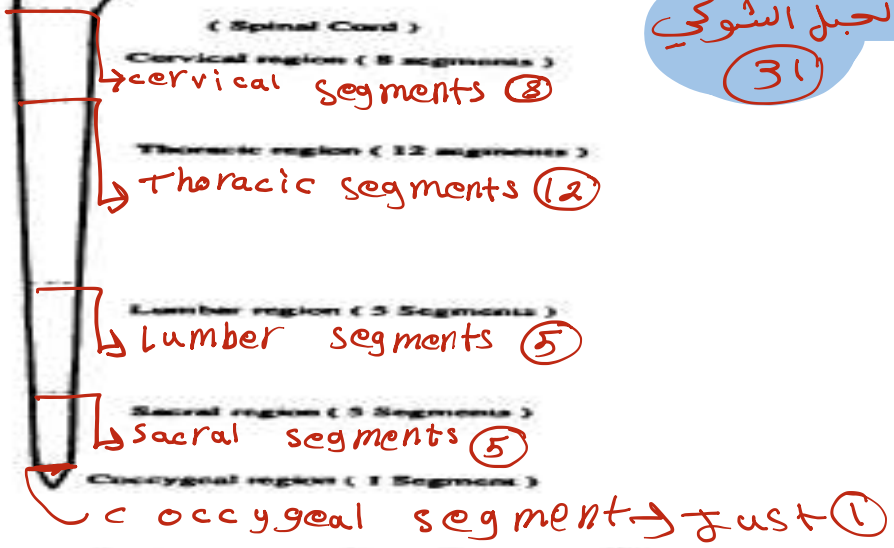
المخيخ
المستودون
التوازن



جدا هم

مدرقات الجبل الشوكي (31)

2 منهم هدرية



Structure of central nervous system and cross section of spinal cord

← یوہل CNS کی باقی الجسم

Peripheral Nervous System (PNS)

- It is the part of NS which communicate between the CNS and peripheral tissues.

Divisions:

A) Anatomical divisions:

- PNS is composed of 12 pairs of cranial nerves and 31 pairs of spinal nerves which contain:

1- Afferent (sensory) nerve fibers → conduct impulses from surface or inside of body to CNS

2- Efferent (motor) nerve fibers → conduct impulses from CNS to various organs of the body (effectors).

B) Physiological Divisions:

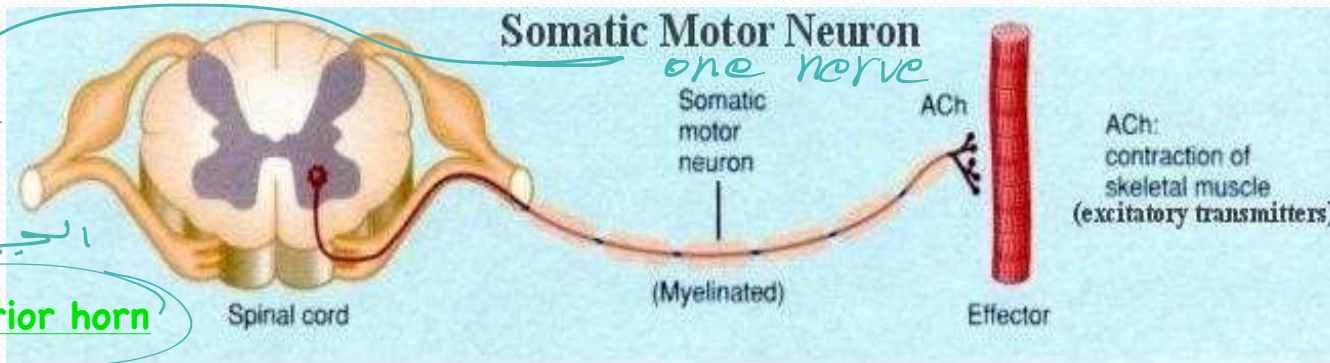
PNS is divided into;

- i) **Somatic N S** → controls voluntary actions. → *يمكنني التحكم بها*
- ii) **Autonomic N S** → controls involuntary actions

*بإرادة
الإنسان*

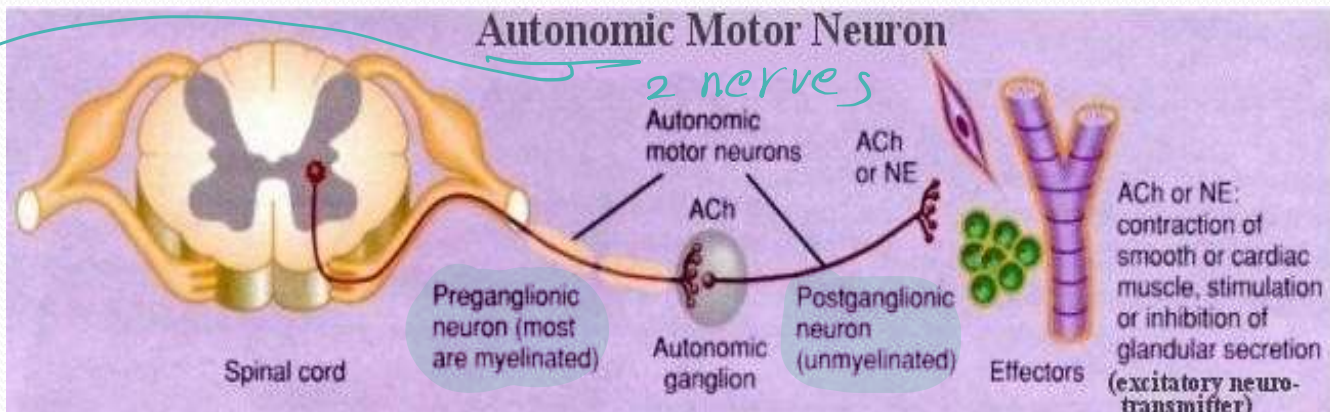
*الجهاز العصبي يخرج
من*

Anterior horn



*الجهاز العصبي يخرج
من*

Lateral horn



Somatic and autonomic nervous systems

Table 1: Comparison between somatic and autonomic nervous systems

	Somatic N S	Autonomic N S
Control	Voluntary functions	Involuntary functions
Connections	With skin, <u>skeletal</u> muscles, bones and joints.	With smooth → موجوده في الأمعاء muscles, glands and cardiac muscle.
Center جذع المخ	Spinal cord → AHCs Brain stem → somatic motor nuclei	Spinal cord → LHCs Brain stem → visceral motor nuclei

	Somatic N S	Autonomic N S
Efferent (motor) fibers	<ul style="list-style-type: none"> - <u>One neuron.</u> - No ganglia i.e. not synapse outside CNS). - Thick myelinated nerve fibers (type A) * كل ما خارج العصب اسلاك و محاطة بـ myeline يكون قفل لأن تسري فيه الإشارة بشكل أسرع - Excitatory to skeletal muscle i.e. muscle contraction 	<ul style="list-style-type: none"> - <u>Two neurons.</u> - Presence of ganglia (i. e. synapse outside CNS). - Preganglionic is thin myelinated nerve fibers (type B) - Postganglionic is non-myelinated nerve fibers (type C) - Either excitatory or inhibitory to effector organs.
Effects of <u>denervation</u> قطع العصب	Paralysis and atrophy ضمور في العضلة التي والتي الذي % يستخدمه بعض	No paralysis (smooth muscles are myogenic). تنقبض دون العصب
Chemical transmitters	Acetylcholine	<ul style="list-style-type: none"> - At preganglionic nerve endings: acetylcholine. - At postganglionic nerve endings: acetylcholine or nor epinephrine.

AHCs= anterior horn cells, LHCs= lateral horn cells.

Autonomic Nervous System



Definition:

It is the part of the PNS which supplies and regulates the functions of internal organs i.e. viscera of the body.

Divisions of ANS

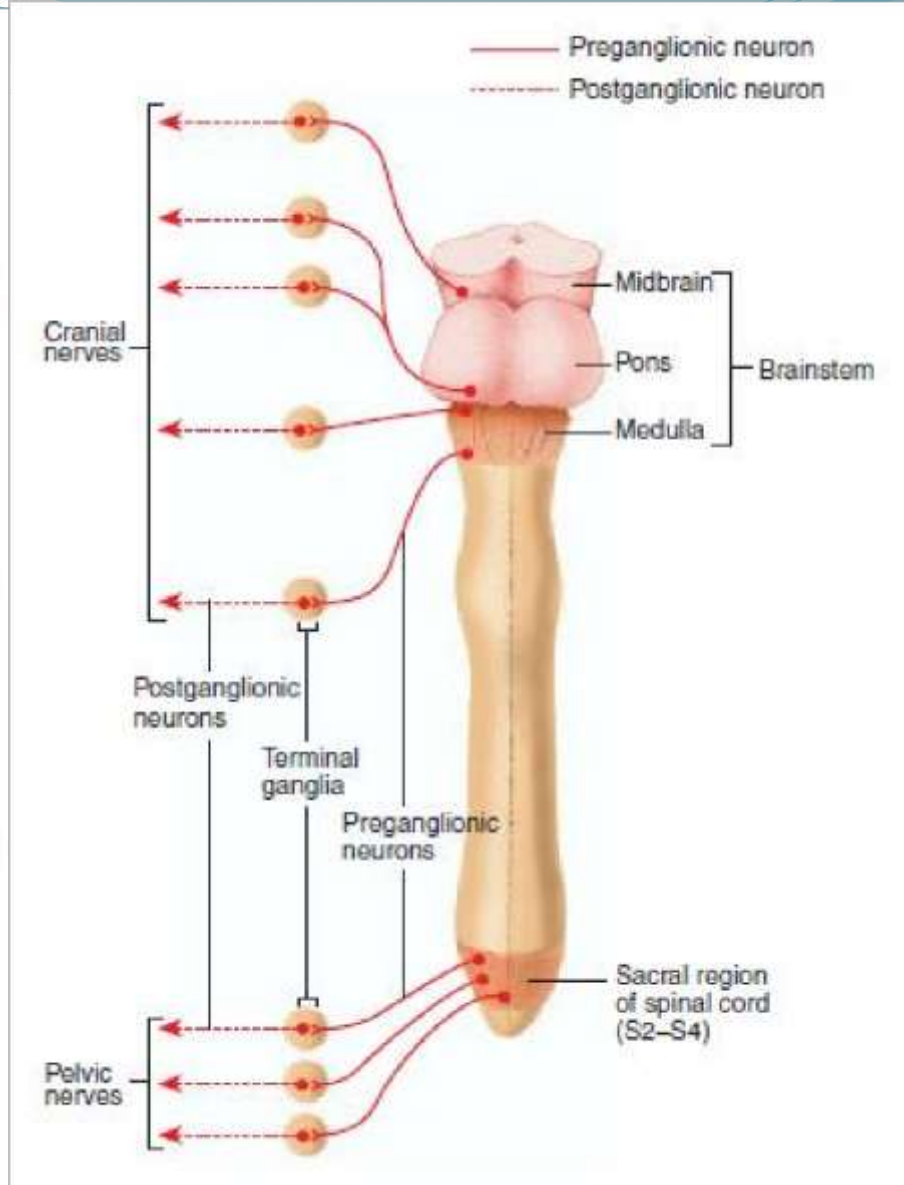
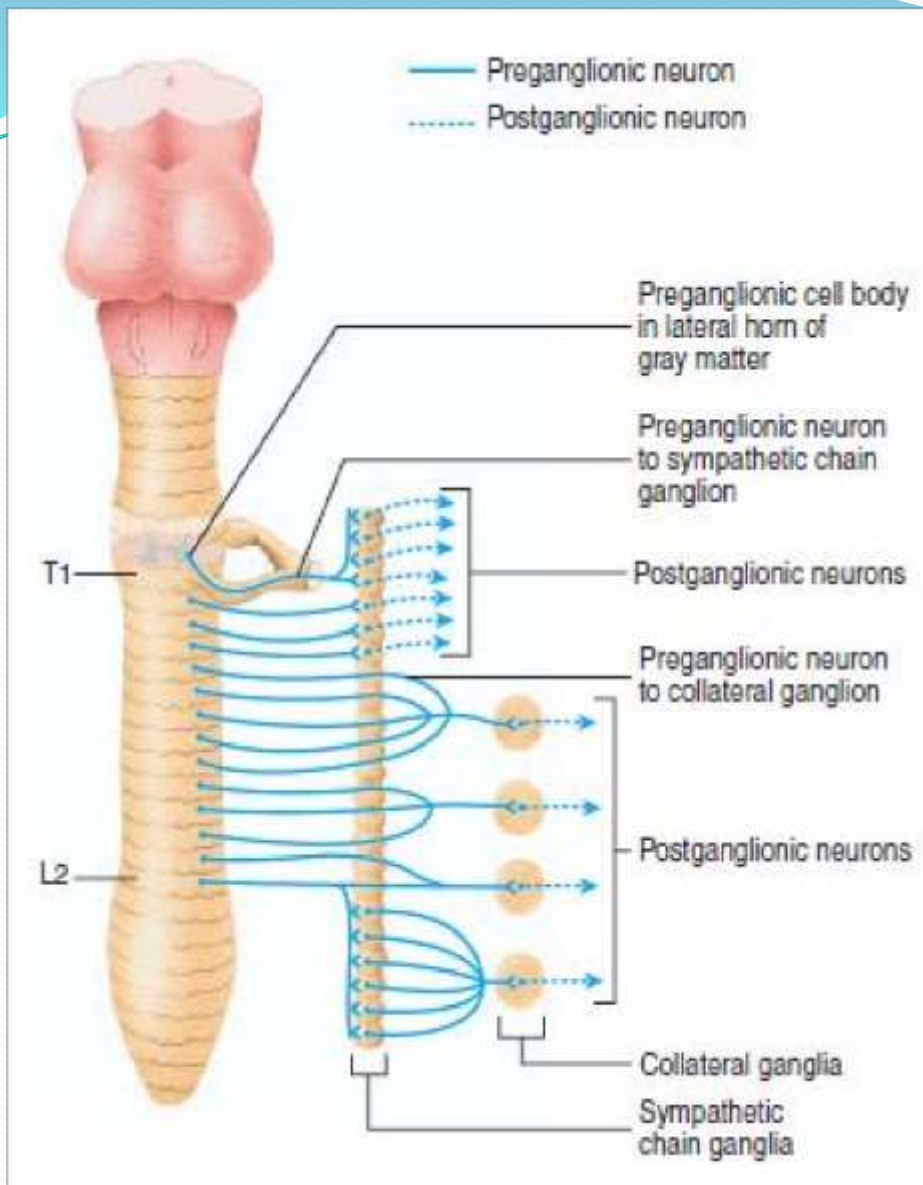
ANS is subdivided into 2 systems;

- i) Sympathetic (thoracolumbar) NS : originates from LHCs of all thoracic and upper 3 lumbar segments of the spinal cord**
- ii) Parasympathetic (craniosacral) NS: originates from 2 parts;**

A- Cranial part: arises from visceral motor of the following cranial nerves:

1. **Oculomotor nerve in midbrain.**
2. **Facial nerve in pons.**
3. **Glossopharyngeal nerve in the medulla oblongata.**
4. **Vagus nerve in the medulla oblongata.**

B-Sacral part: arises from 2nd, 3rd and 4th sacral segments of the spinal cord and forms pelvic nerve



sympathetic (a) and parasympathetic (b) division of autonomic nervous system

Autonomic Ganglia

Def,

- They are **collection of cell bodies of neurons outside the central nervous system (CNS).**

Functions:

- Act as a **relay station for autonomic preganglionic nerve fibers**



Functions of autonomic ganglia

Types:

a) Lateral (paravertebral) ganglia:

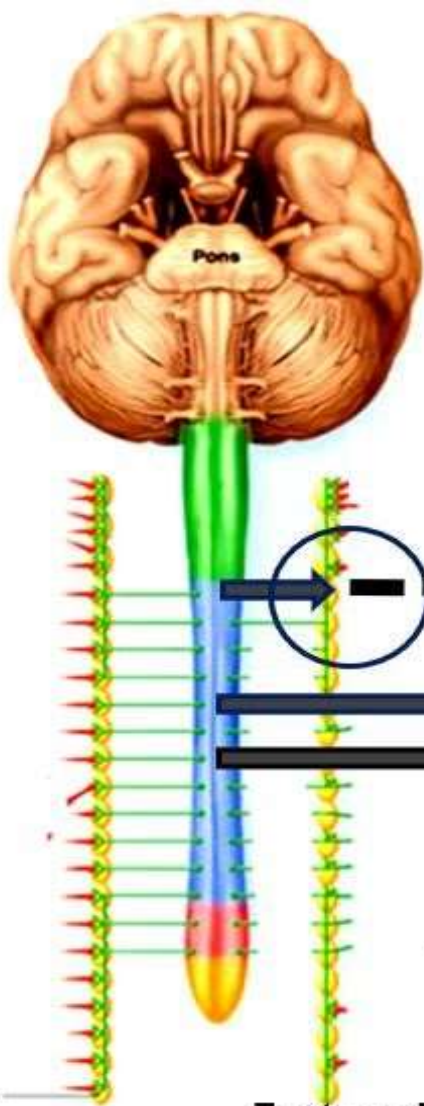
- Located **on either side of the spinal cord.**
- About 22-24 ^{عقد} ganglia on each side.
- Form **2 rows of sympathetic chain of ganglia.**
- Act as a relay station for preganglionic sympathetic nerve fibers only.

b) Collateral (prevertebral) ganglia:

- Present mainly in the abdomen, **midway between spinal cord and viscera.** → ^{العقد}
- Act as a relay station for **sympathetic preganglionic nerve fibers.**

c) Terminal ganglia:

- Present **close to or at the wall the effector organs** especially rectum; urinary bladder reproductive organs in the pelvis.
- Act as a relay station of:
 - All parasympathetic preganglionic fibers.
 - Some sympathetic preganglionic fibers.



Preganglionic nerve fibers

Postganglionic nerve fibers



Small intestine

Large intestine

Rectum

Collateral or prevertebral G.

Terminal G.

Lateral or paravertebral G.

ما بين العفوى

vertebral column

sympathetic chain

Types of autonomic ganglia

دخلى
الفرجة من العفوى

Sympathetic chain ganglia