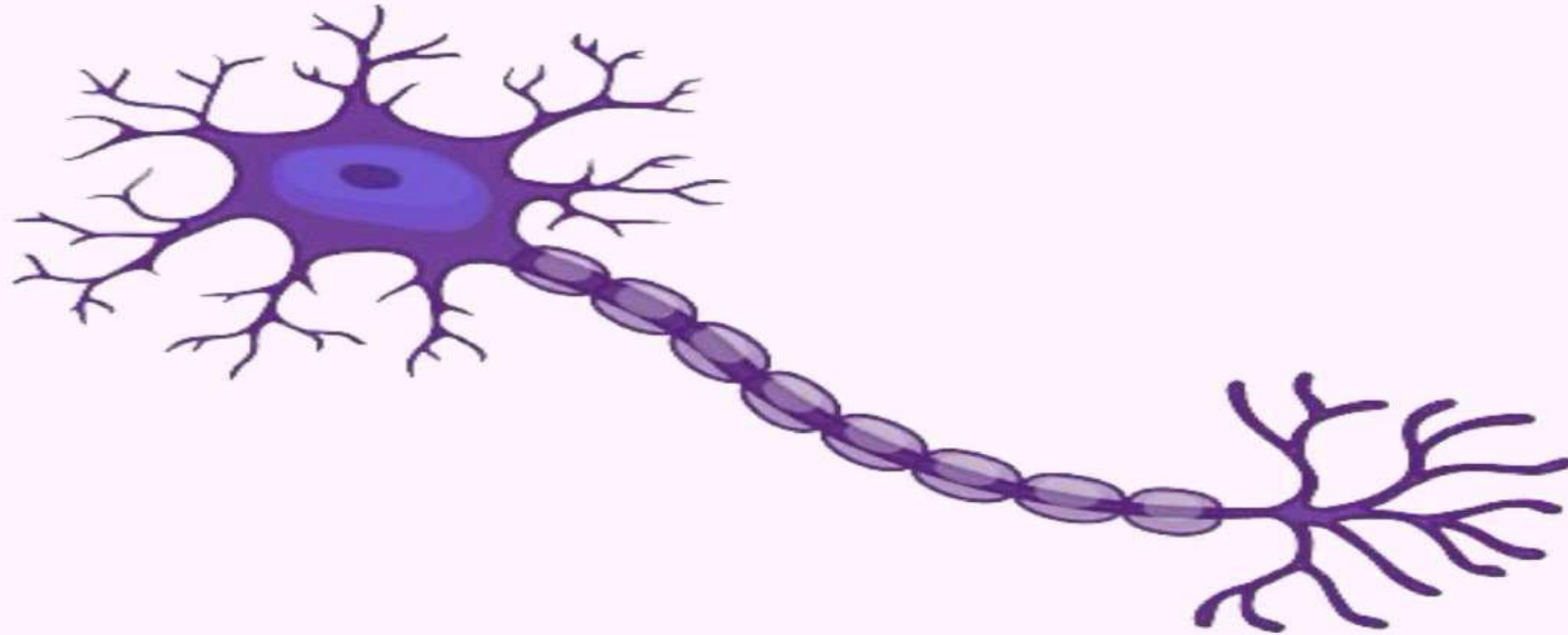




# PHYSIOLOGY



LEC NO. : 5 + 6  
DONE BY : Nour Alamoush

# Autonomic Nervous System

الجهاز العصبي

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

+ endocrine system

الفرق بين endocrine system و nervous system هو انه الجهاز العصبي بيشتغل بسرعة اكبر.

system → organs → tissues → cells

## Nerve Cell (Neuron)

الوحدة البنائية

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

## Structure:

It is formed of:

- a) **Cell body (soma): controls the activity of the whole neuron.**

كل النشاط

بحيرون

مثل : انقسام ، إنتاج الطاقة

- b) **Cell processes: 2 types axis and dendrites**

دہایا ہے

## The axon near its termination either joins:

مکان axon  
پر تہیج ہ  
اُسیا:

①

• Muscle → neuromuscular junction.

②

• Gland → neuroepithelial junction.

③

• Dendrites or soma of another neuron → neuro-neural

junction. → شئی مثل  
رہا ہے

### c) Types

a. Afferent (sensory) neuron → carries impulses from receptors to CNS.

بسیجیل الایسار

b. Efferent (motor) neuron → carries impulses from CNS to effector organs.

یجیل الایسارج می مکان ای مکانی

(الجزء المتأثر)

c. Interneuron (associative) → located entirely within CNS.

زوائد تقوم بربطها مع الشجرة لتوصل  
الإشارة الحسية  
وهي العُستينيل.  
(عدد كبير جداً)

Dendrites

Axon terminals

Cell body  
مثل ذي خلية

Node of ranvier

Schwann's cells

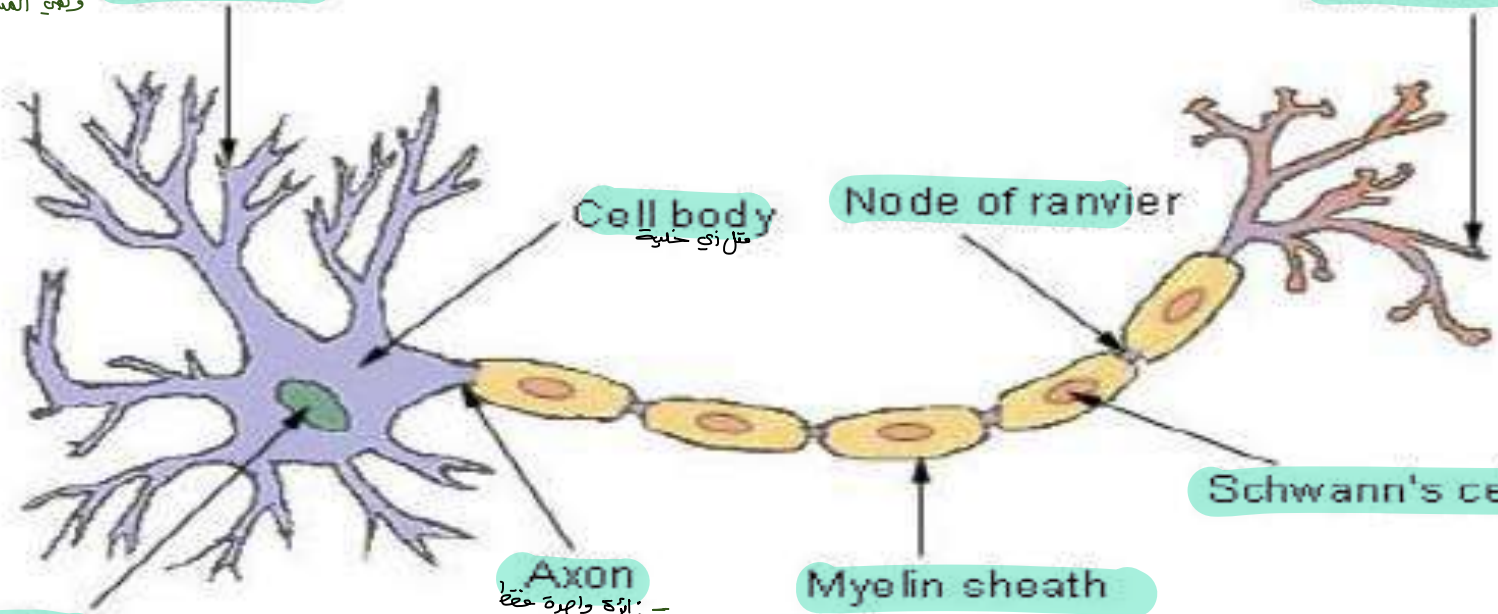
Axon  
- زائفة دايرة عظمى

Myelin sheath

Nucleus

نواة  
عشاشا الا تقسم وحفظ  
تكون في الكها نزل الصبي الجوزي  
أما المركزي ما ينقسم .

Fig. (9): Structure of neuron



## Definition

# Reflex Action

لا إرادي

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

الجهاز العصبي يغذي كل شيء في الجسم من skin, muscles, gland وغيرها  
كل هائي الحالات الجهاز العصبي بيشتغل بالفعل العاكس involuntary response to stimuli

## Pathway (reflex arc):

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

neuron

## **Components of reflex arc are:**

i- **Receptors.**

ii- **Afferent (sensory) neuron**

iii- **Center (in CNS).**

iv. **Efferent (motor) neuron**

v. **Effectors (muscles or glands).**

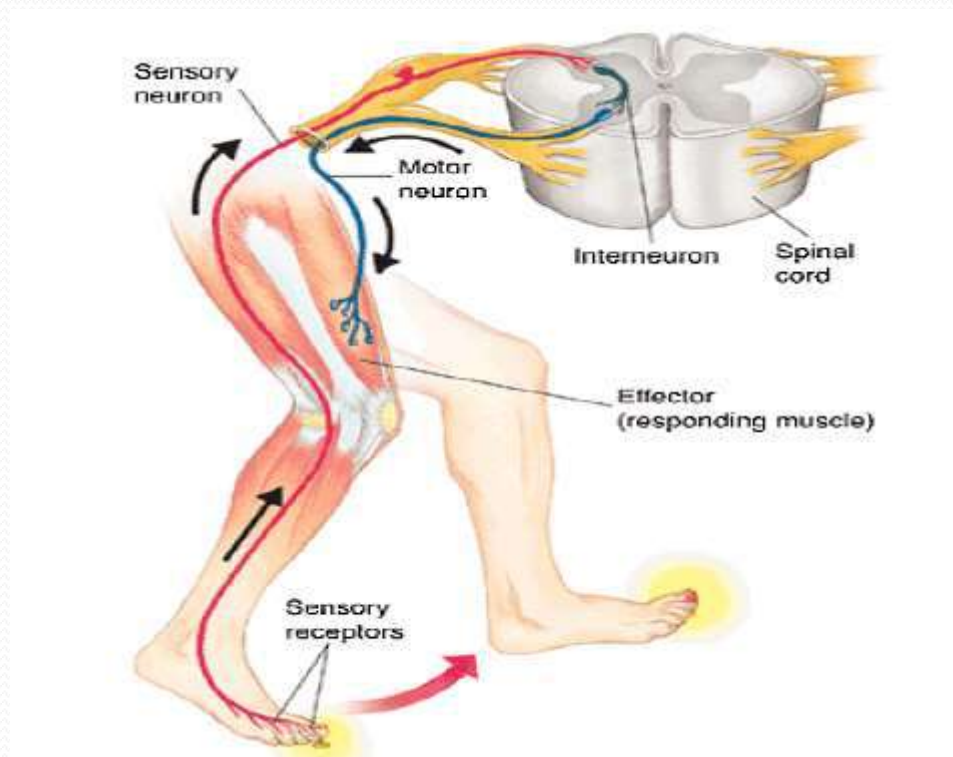
من ابسط الامثلة لما تتعرض للحرارة ف بتبعد عنها بسرعة، طيب ايش يلي بصير؟  
في skin يكون في نهايات عصبية ف يكون عنا afferent neuron، الاشارة مرت من  
خلال هذا العصب و بعدين دخل الى فقرة من فقرات الحبل الشوكي، و حفز integrated  
neuron و هو نوع ثاني من الاعصاب، و بيوصل الاشارة من مكان لمكان و بيوصل بين  
afferent & efferent و بيترجم الاشارة و بفسرها، الاشارة رح توصل للefferent  
هو موصول بالmuscle يلي رح تعمل flexion

The picture can't be displayed.



## Types:

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

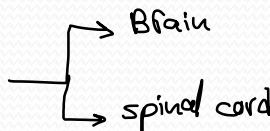


Reflex arc (flexion withdrawal reflex)



## Divisions of Nervous System

The nervous system is divided into:

- i) **Central nervous system (CNS)**. <sup>المركزی</sup>  Brain  
spinal cord
- ii) **Peripheral nervous system (PNS)**. <sup>الطرفی</sup>

اسی تعلقوں میں ہوتا  
الہیجہز المركزي، کا یہاں  
تقریباً .

## Central Nervous System (CNS)

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

Brain ↓

spinal  
cord ↓

### Parts:

It consists of 2 parts;

#### 1) Brain

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

المخ  
نصف دائرة  
↑  
I. **Cerebrum** ( 2 cerebral hemispheres); consists of;

- **Cerebral cortex**  
قشرة خارجية
- **Subcortical centers:** include  
Base  
قشرة

- المهاد  
قشرة المهاد  
↓  
1- **Thalamus** 2- **Hypothalamus** 3- **Basal ganglia.**  
↓  
المركز المسئول عن  
الجموعى / الحشن / الحرارة  
المشاعر

جزع الدماغ  
II. **Brain stem:** consists of: → in general  
فيها العنق اللاإرادية

- الدماغ المتوسط  
النخاع المستطيل  
1. **Midbrain** 2. **Pons** 3. **Medulla oblongata.**

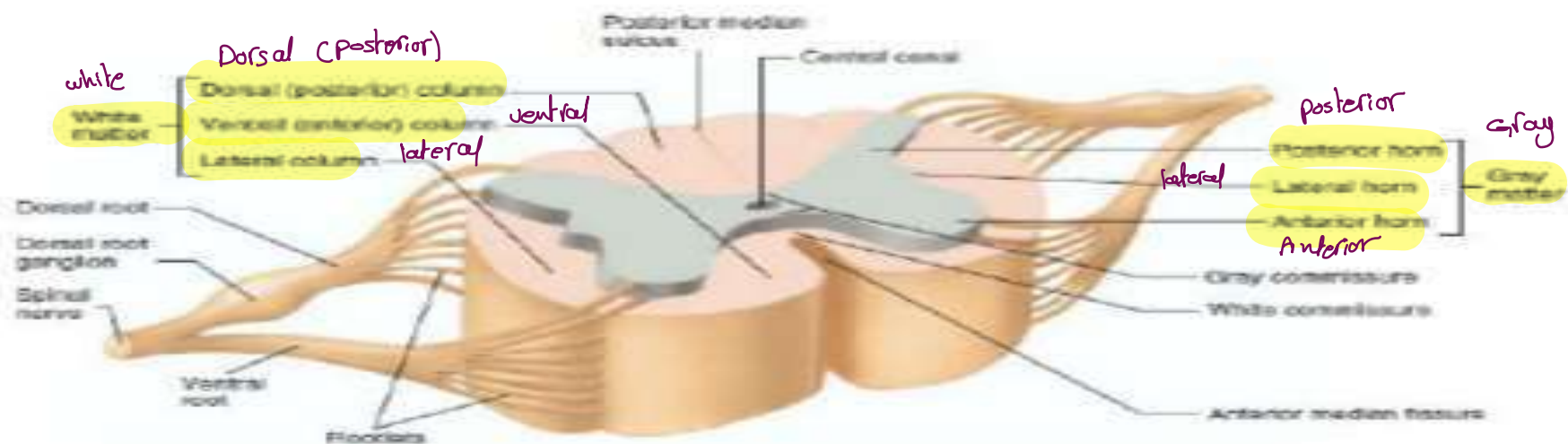
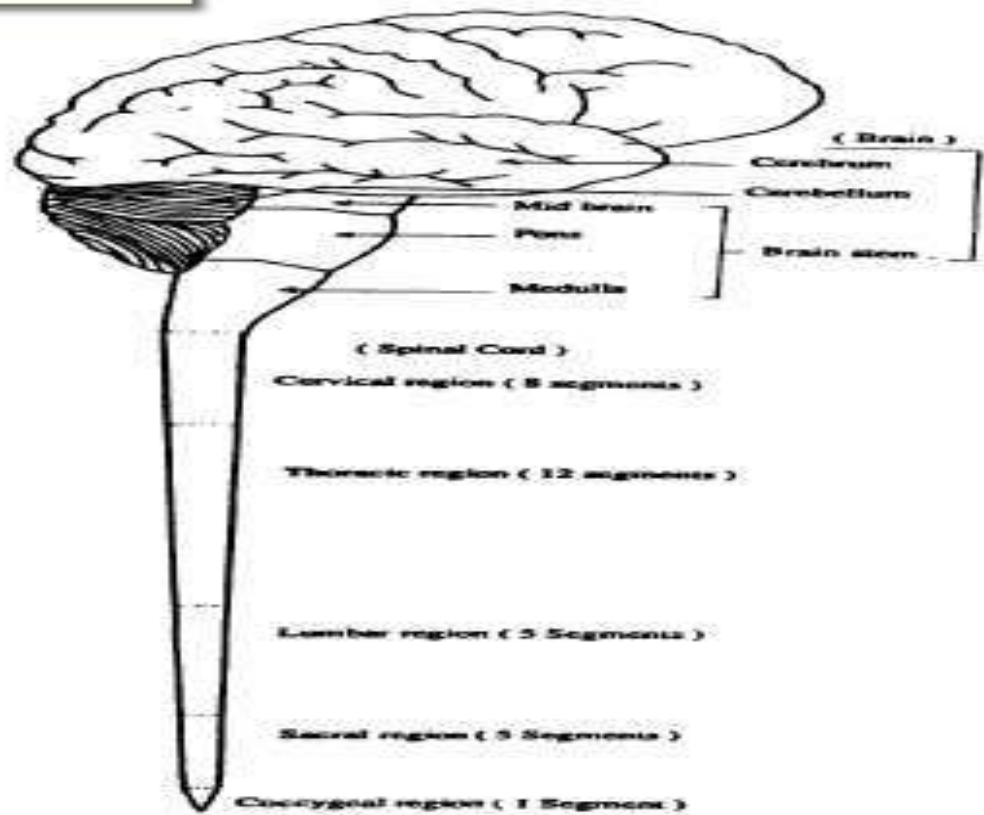
- المخيخ  
مسؤول عن التوازن  
ووضوح الجسم  
→  
i- **Cerebellum.**

العمود الشوكي  
عاجز من مسارات  
عصبية

## 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 last vertebrae.
- The spinal cord consists of 2 parts:
  1. Outer white matter: anterior, posterior and lateral column  
lipid layer.
  2. Inner gray matter: anterior, posterior and lateral horns  
no lipid layer

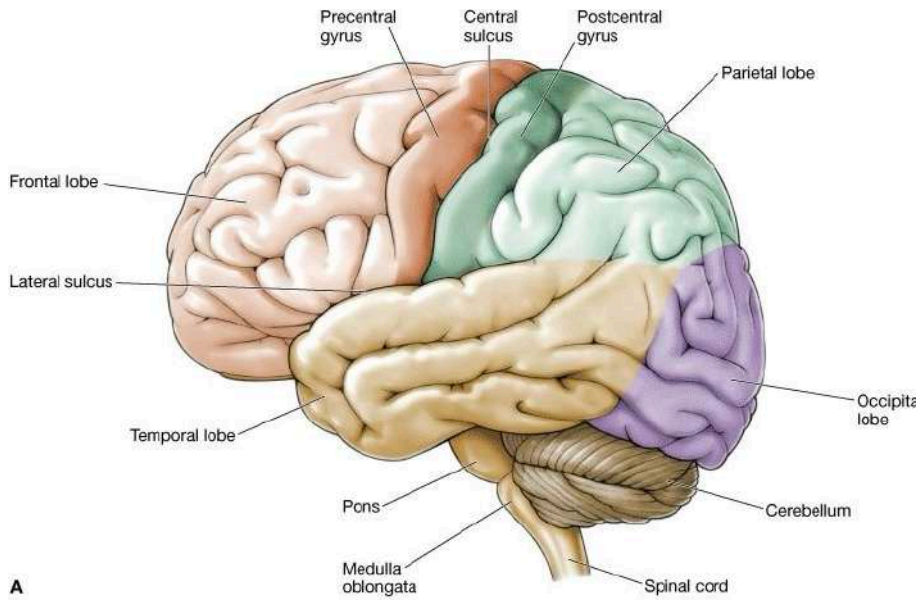
له ايمن بيكون لونها رمادي؟  
هو المسؤول عن انتقال  
لونها ابيض



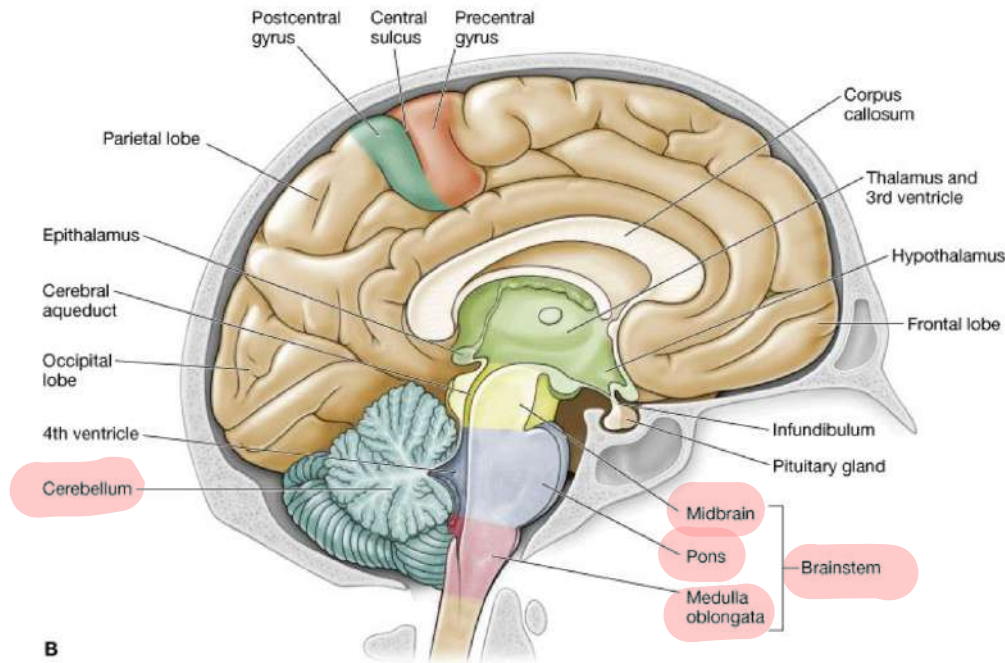
Structure of central nervous system and cross section of spinal cord

# صور أوصف لأنه الأجزاء حفظاً

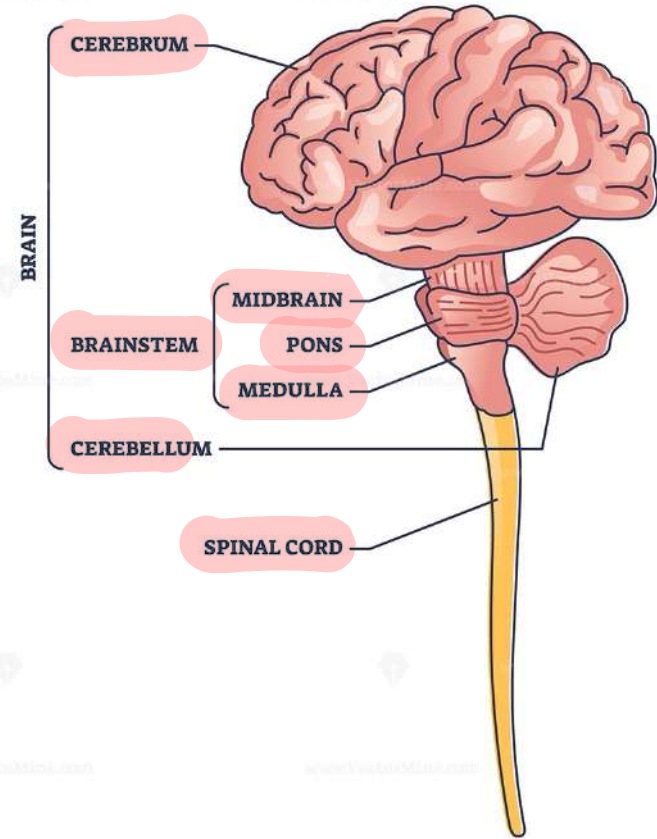
## CENTRAL NERVOUS SYSTEM



A



B



6

## Peripheral Nervous System (PNS)

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

العنكبتي مع باقي الجسم

### Divisions:

تقسيم

#### A) Anatomical divisions:

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

عشرون زوجاً، نسبتاً عليها

من الحبل الشوكي من السك

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

من الطرفي للعنكبتي

من العنكبتي للطرفي

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



أجزاء

## B) Physiological Divisions:

PNS is divided into;

nervous system.

i) **Somatic NS** → controls **voluntary** actions.

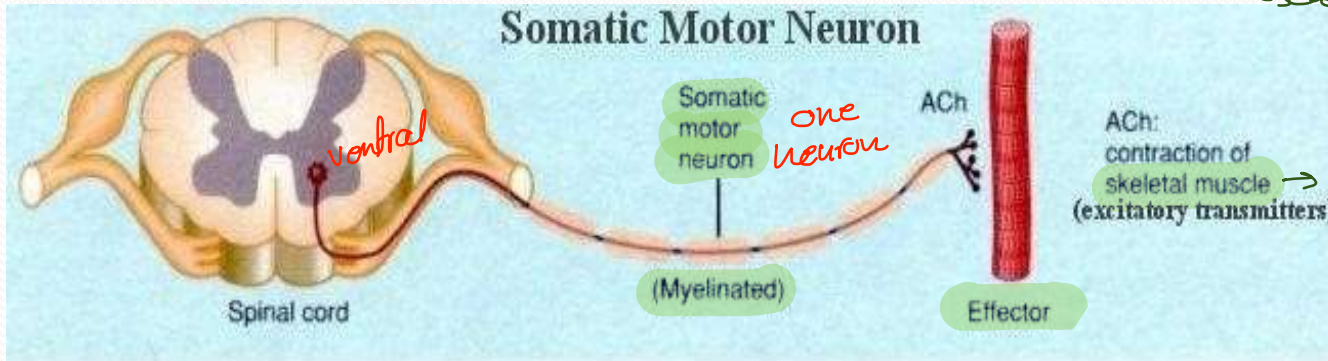
إرادية

مثل الحركة

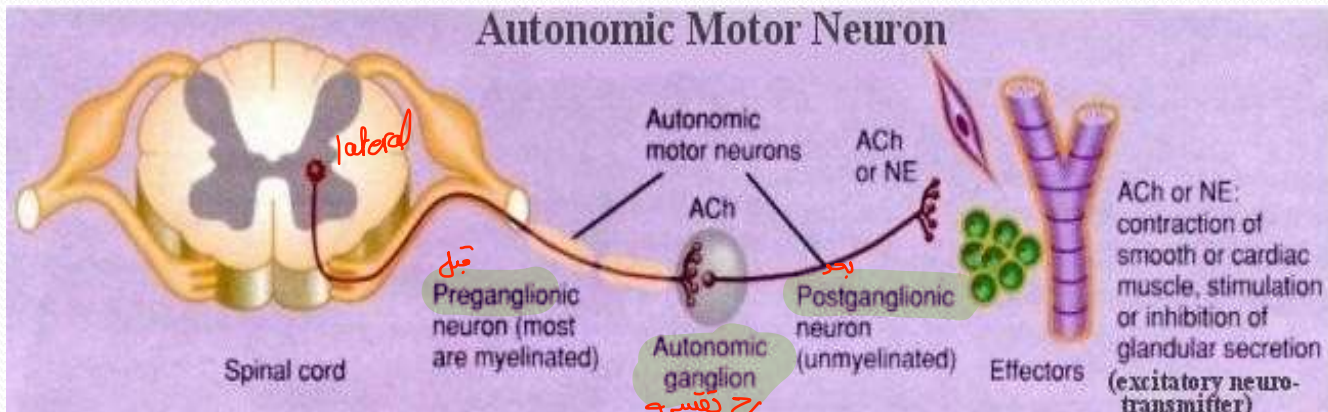
ii) **Autonomic NS** → controls **involuntary** actions

لا إرادية

مثل ضربات القلب، حركة المعدة



إرادية



Somatic and autonomic nervous systems



**Table 1: Comparison between somatic and autonomic nervous systems**

	Somatic N S <span style="color: red;">الإرادي</span>	Autonomic N S <span style="color: red;">اللا إرادي</span>
<b>Control</b>	<b>Voluntary functions</b>	<b>Involuntary functions</b>
<b>Connections</b>	With skin, skeletal muscles, bones and joints.	With smooth <span style="color: red;">→ such as in stomach ...</span> muscles, glands and cardiac muscle.
<b>Center</b>	<sup>①</sup> Spinal cord → AHCs <sup>②</sup> Brain stem → somatic motor nuclei	<sup>①</sup> Spinal cord → LHCs <sup>②</sup> Brain stem → visceral motor nuclei

١. مكن ما كان ذا الحسب سمياً ومخاطب له من كل ما كانت سرعة الإشارة أكبر ما العكس صحيح  
 ← عمل الأحشاء بطيء ، عمل العضلات سريع

	Somatic N S	Autonomic N S
<b>Efferent (motor) fibers</b>	<ul style="list-style-type: none"> <li>- One neuron.</li> <li>- <b>No ganglia i.e. not synapse outside CNS).</b></li> <li>- <b>Thick myelinated nerve fibers (type A)</b></li> <li>- <b>Excitatory to skeletal muscle i.e. muscle contraction</b></li> </ul>	<ul style="list-style-type: none"> <li>- Two neurons.</li> <li>- <b>Presence of ganglia (i. e. synapse outside CNS).</b></li> <li>- <b>Preganglionic is thin myelinated nerve fibers (type B)</b></li> <li>- <b>Postganglionic is non-myelinated nerve fibers (type C)</b></li> <li>- Either excitatory or inhibitory to effector organs.</li> </ul>
<b>Effects of denervation</b>	Paralysis and atrophy <small>شلل مع الوتد لوما صبار علاج طبيجي.</small>	No paralysis (smooth muscles are myogenic). <small>لا شلل</small>
<b>Chemical transmitters</b> <small>ناقل كيميائي.</small>	<b>Acetylcholine</b>	<ul style="list-style-type: none"> <li>- <b>At preganglionic nerve endings: acetylcholine.</b></li> <li>- <b>At postganglionic nerve endings: acetylcholine or nor epinephrine.</b></li> </ul>

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

# Autonomic Nervous System

involuntary  
part of the peripheral (أجزاء الجسم)

## Definition:

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

أجزاء الجسم

## Divisions of ANS

ANS is subdivided into 2 systems;

i) **Sympathetic (thoracolumbar) NS** : originates from LHCs of all

من 1-12

**thoracic** and **upper 3 lumbar** segments of the spinal cord (31)

أجزاء الجسم

عائس  
بحزن  
functions

ii) **Parasympathetic (craniosacral) NS**: originates from **2** parts;

عول

cranial, sacrum

موجودين في المخ

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

اي عصب من cranial nerve حامل parasympathetic nerve  
و هما العصب 3، 7، 9، 10

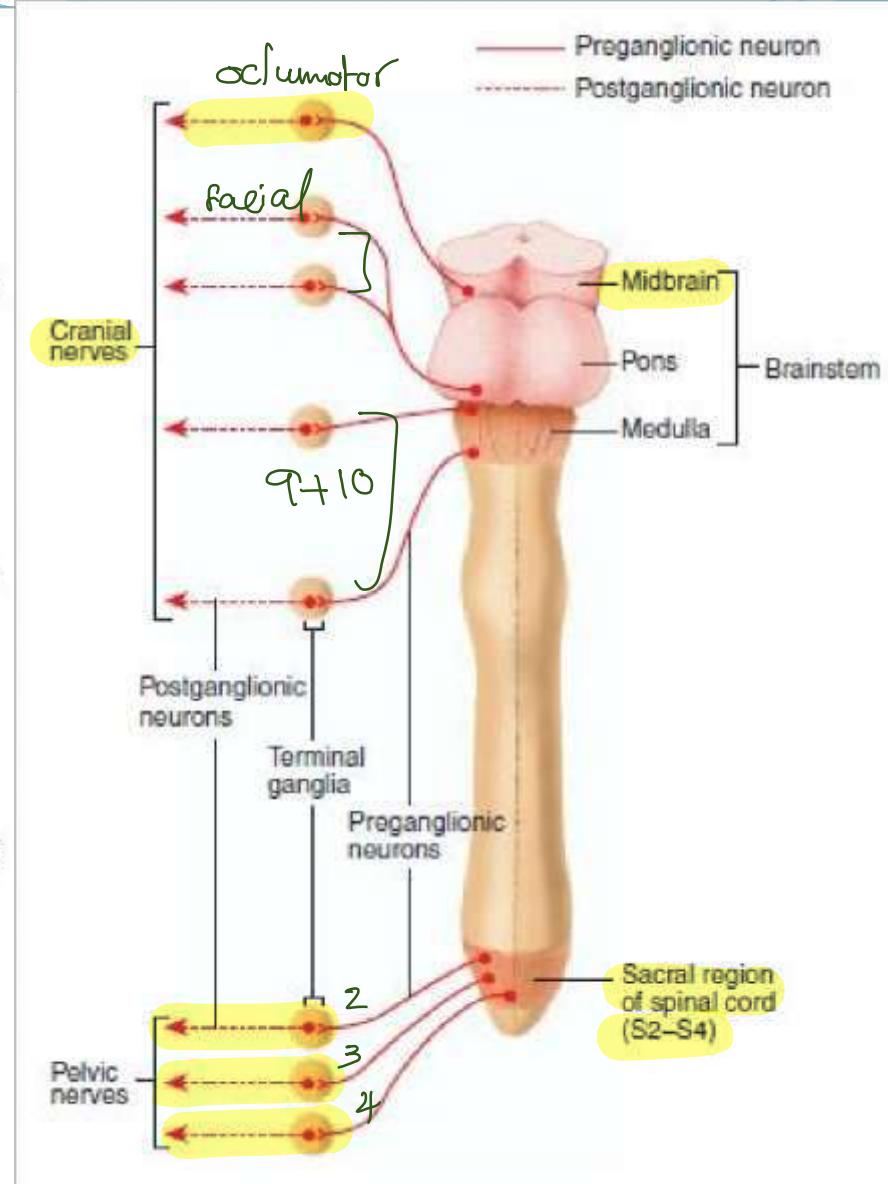
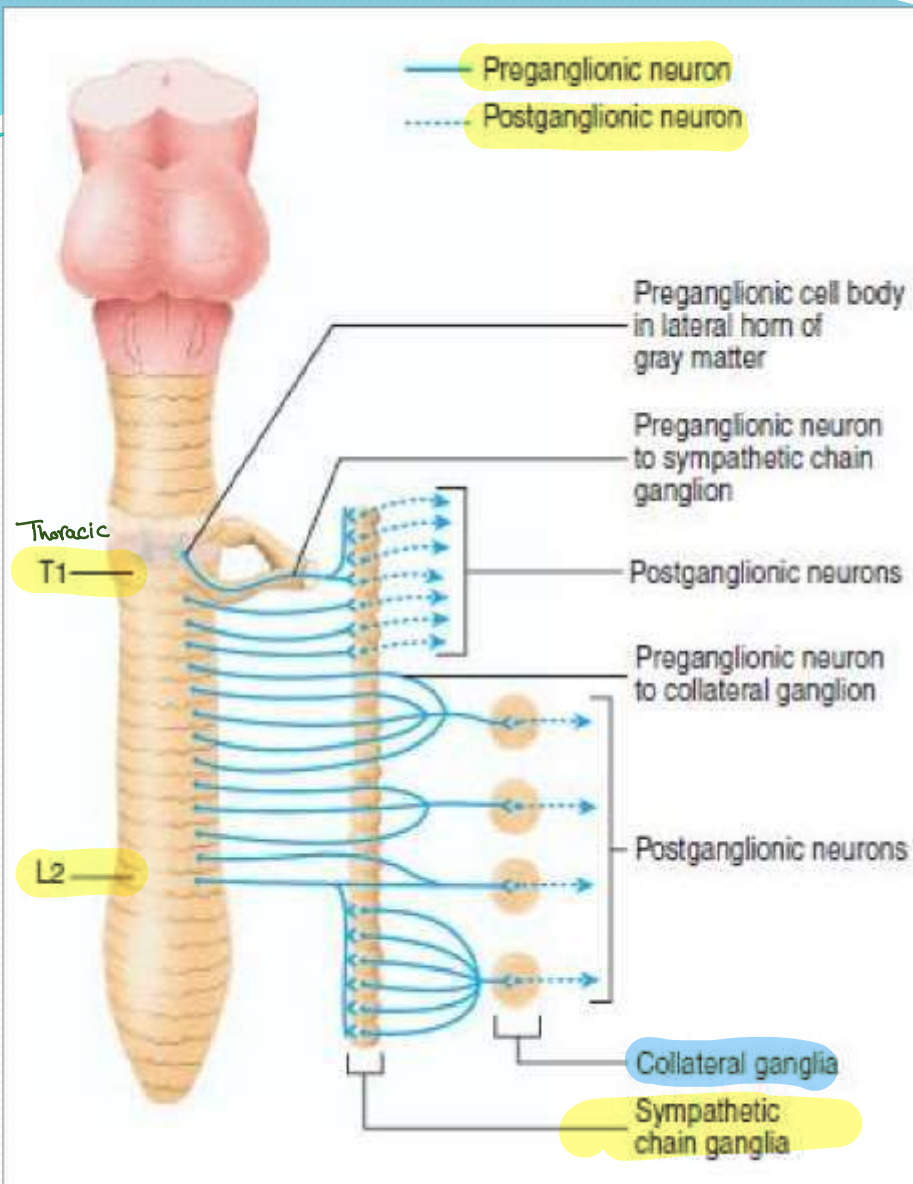
### cranial nerves:

1. <sup>العصب الثالث</sup> **Oculomotor nerve** <sup>12 nerve → optic, olfactory</sup> **in midbrain.**
2. <sup>العصب السابع</sup> **Facial nerve** **in pons.**
3. <sup>العصب التاسع</sup> **Glossopharyngeal nerve** <sup>The last part of brain</sup> **in the medulla oblongata.**
4. <sup>العصب العاشر</sup> **Vagus nerve** **in the medulla oblongata.**

طالعة من اقصا

## B-Sacral part: arises from 2nd, 3rd and 4th sacral segments of

the spinal cord and forms pelvic nerve



sympathetic (a) and parasympathetic (b) divisions 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** ganglia on each side.
- Form **2 rows of sympathetic chain of ganglia**.
- Act as a relay station for preganglionic sympathetic nerve fibers only.

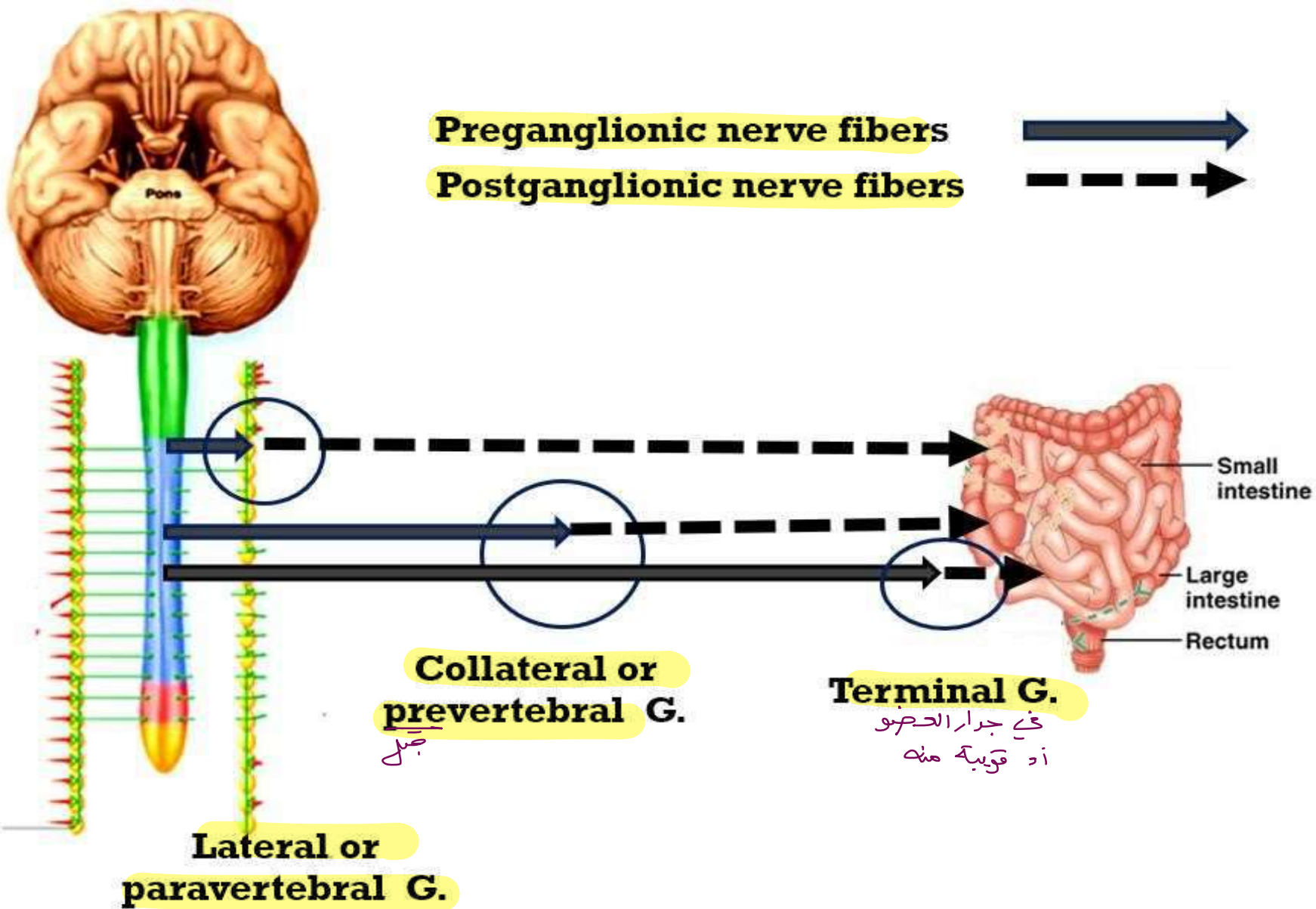
### b) Collateral (prevertebral) ganglia:

- Present mainly in the abdomen, **midway between spinal cord and viscera**.
- 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.



Types of autonomic ganglia

# (I) Functions of Sympathetic NS

Sympathetic و parasympathetic → very important notes.  
هما عكس بعض

## A) Sympathetic Supply to Head and Neck:

**Origin:** <sup>↓</sup> The system of stress

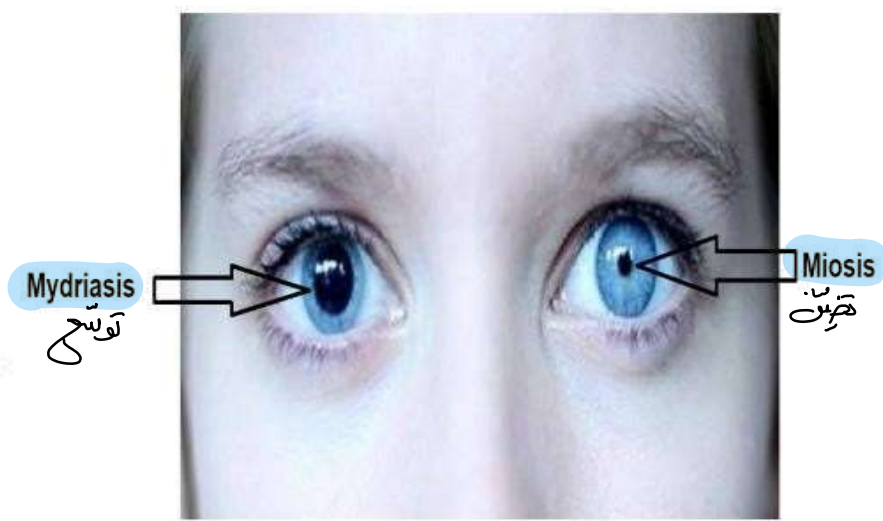
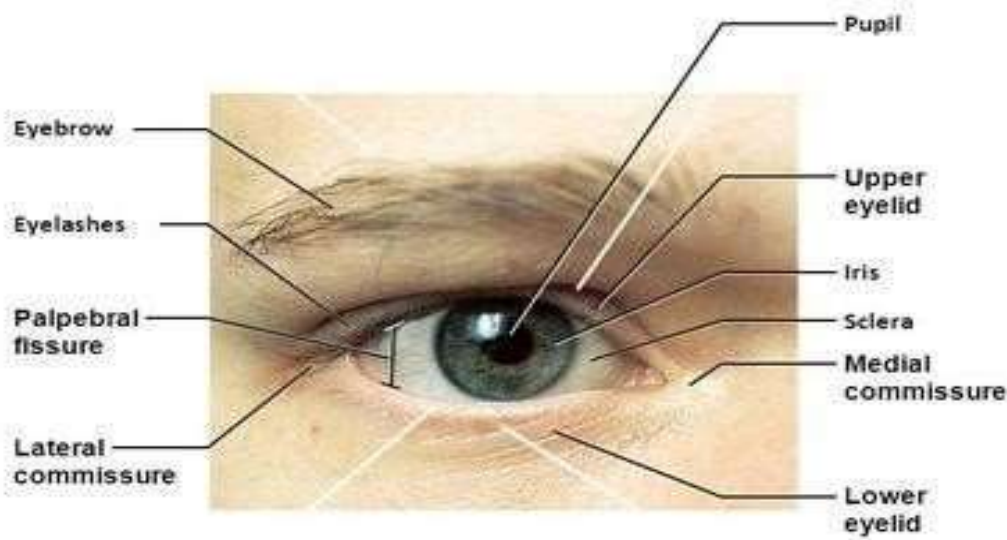
- LHCs of **first and second thoracic segments**  
<sub>1st + 2nd</sub>

### Functions:

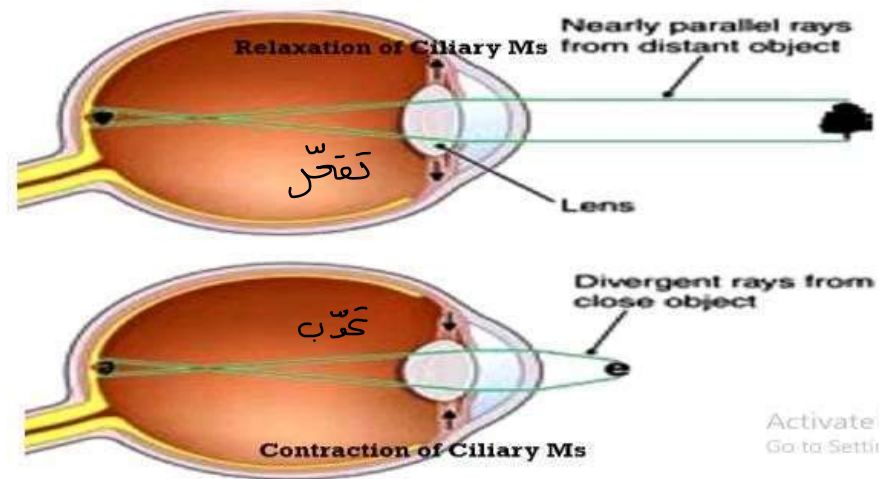
#### 1) Eye:

- a. Causes **dilatation of pupil (mydriasis)** → <sup>توسيع في البؤبؤ</sup> يتخلل ضوء الشمس  
تحسن مستوى الرؤية.
- b. Causes **widening of palpebral fissure**.  
<sup>توسيع</sup> <sup>بفضل من خلاها الحزوء</sup> <sup>opening</sup>
- c. Causes **exophthalmos**.  
<sup>بروز في العين</sup>
- d. **Helps the eye to see far objects**

حارسه للعين بحيزها تفتت  
لأنه التحتر خليات تشوف  
البل



Palpebral fissure and dilatation of pupil (mydriasis) and constriction of pupil (miosis)



Activate Win  
Go to Settings to

showing exophthalmos and relaxation of ciliary ms to see far objects

الخد اللطابة

para → يوسح الأوعية  
المحوية .

**2) Salivary Glands:** → will be fully explained  
in GI system.

تحنيق الأوعية

a. **Vasoconstriction (V.C.) of salivary gland blood vessels.**

بمرازات غذائية

لزج

b. **Trophic secretions: little, viscous, concentrated secretion;**

**poor in water and rich in enzymes**

عنان يساعده في عملية الهضم

**3) Skin:**

برضو تحنيق في الأوعية

I. **V.C of skin blood vessels.**

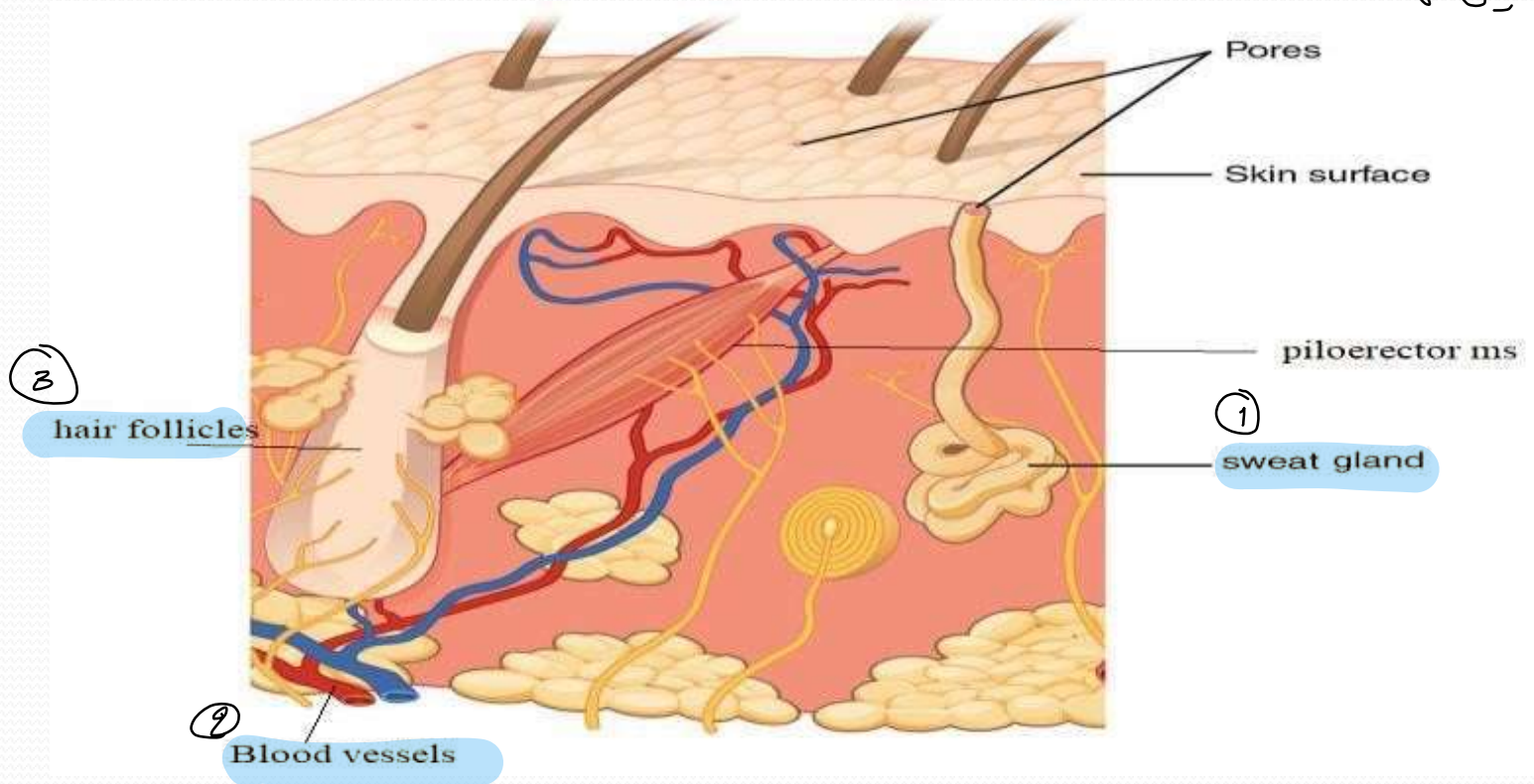
وجود فيها بخرى غدد عميقة ، أوعية دموية .

مثل العشيرة → **Hair erection**  
عند التحرف لبرد شديد ف الشعر لما يوقف يعمل حاجز بين الهواء و skin .

III. **Sweat secretion.**



مش لیٹر دھکتہ



## Structure of skin

یہی جیسے کہ  
تصویرات  
1 + 2 + 3

الصدر

## B) Sympathetic Supply to Thorax:

↓  
heart + lungs

### Origin:

- LHCs of upper 4 or 5 thoracic segments of spinal cord.

### Functions:

1) Heart: → الوظيفة الأساسية للقلب هو ضخ الدم. → كل وجع في القلب يزداد.

I. It ↑es the heart rate and force of contraction

II. vasodilatation of coronary vessels → الوظيفة الدموية التي تغذي القلب هي التروية التاجية →

2) Lungs: لها جعل تمرير ذبانا يكون حاجة له. ولازم العمارة الهوائية تفتح.

وهي حالة الوعده يلي ما يجعل تخرج و إنما توسع عشان يسمح للمخ البر من الدم بضاعت.

I. Bronchodilatation. ⇒ تعسح الشعب الهوائية.

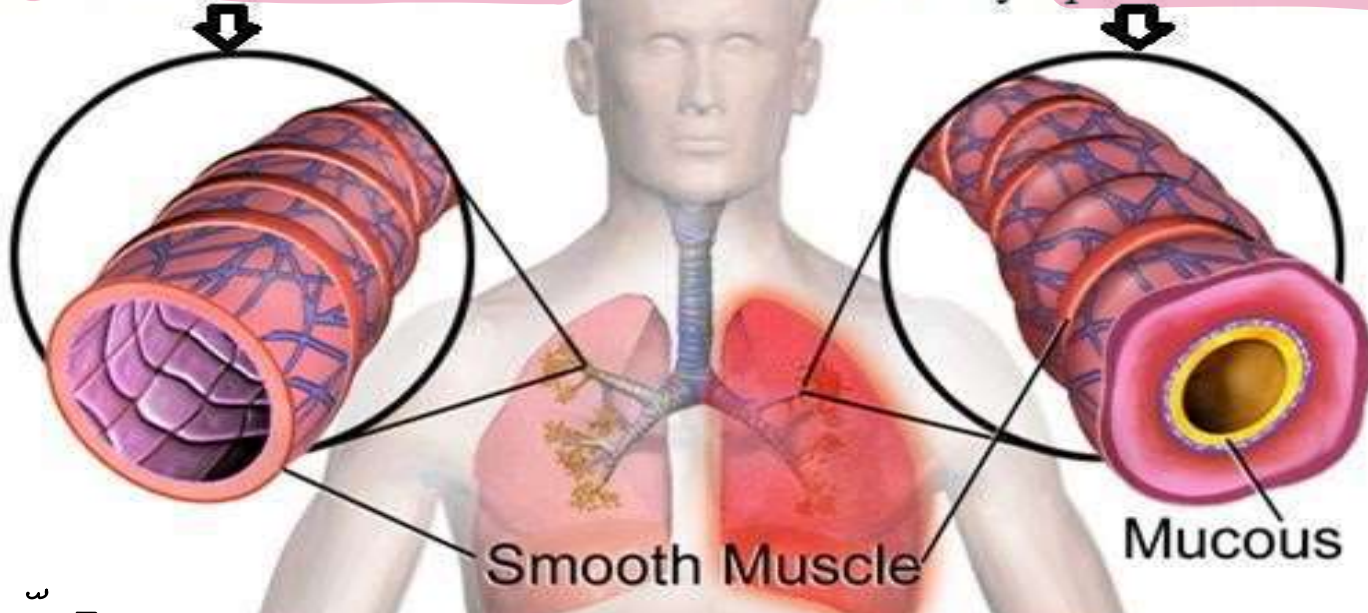
II. Decreases mucus secretion of air passages.

المخاط منهم هذنا عشان الجوار يضل رطب وها يصير له تلف لو امتلأت الشعب الهوائية بالمخاط ما راح تقدر تنفس.



Sympathetic stimulation

Parasympathetic stimulation



Bronchodilatation

Brochoconstriction

توسيع + تقليل  
المخاط

تضييق +  
زيادة المخاط

Sympathetic stimulation to lungs and air passages

البطن

## C) Sympathetic Supply to Abdomen:

### Origin:

- LHCs of T6-12 segments of spinal cord (splanchnic nerves).

### Functions:

1. GIT → الجهاز الهضمي

Relaxation of their walls and contraction of their sphincters

العضلات

يخضع بوقف

كل وظائف العضلات  
لأنه العضلات تحتاج طاقة للجدار + عضلات صامخة + دم

2. Gall bladder: المرارة  
تفرز الصفراء الصفراء ويخضع وامتصاصه الايون

Relaxation of its wall and contraction of sphincter of Oddi → retention of bile

احتفاظ

3. Spleen: الطحال → لما الشخض يحسبه نزيف شديد، الطحال  
يح يطلع الدم الموجود في داخله

Contraction of smooth muscles in splenic capsule and trabeculae → pouring

خسر

of about 250 ml of stored blood into the general circulation.

of blood

4. **Pancreas:** <sup>يشترك</sup>   
 → endocrine → releasing hormones.   
 → exocrine → تصنيع الحماض البنكرياسية وتساعد في الهضم

- It inhibits **both endocrine and exocrine pancreatic secretion.**

5. **Kidneys:** → no urine + feces

→ عتبان زمنج إخراج urine لا يتم أو وقف تصنيغه في بوقفة تدعى الدم لللية من الأساس

- It decreases renal blood flow.
- It decreases urine output.

6. **Suprarenal medulla** <sup>غدة فوق الكظرية</sup>

- It releases large quantities of **adrenaline (80%) and noradrenalin (20%)** into the circulating blood.

علم تماماً مثل علم *sympathetic* وهو يقوى عليه

- In stress conditions, **SRM** acts together with **sympathetic nervous system (sympatho-adrenal system).**

## D) Sympathetic Supply to Pelvis:

### Origin:

Lumber

- LHCs of L1, L2, and L3 segments of spinal cord.

### Functions:

المثانة

1. **Urinary bladder:** causes relaxation of its wall and contraction of **internal urethral sphincter** → retention of urine.   
 إرجاع البول

المستقيم

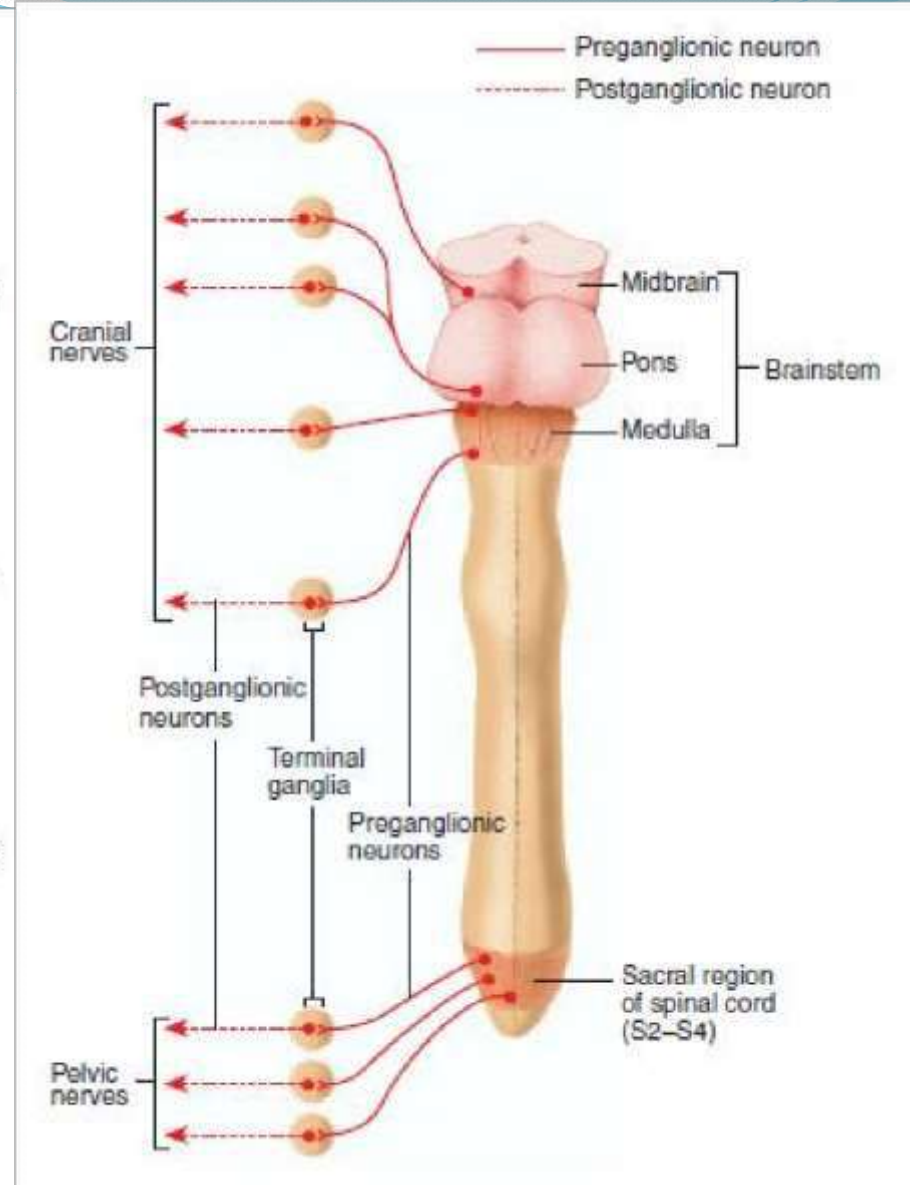
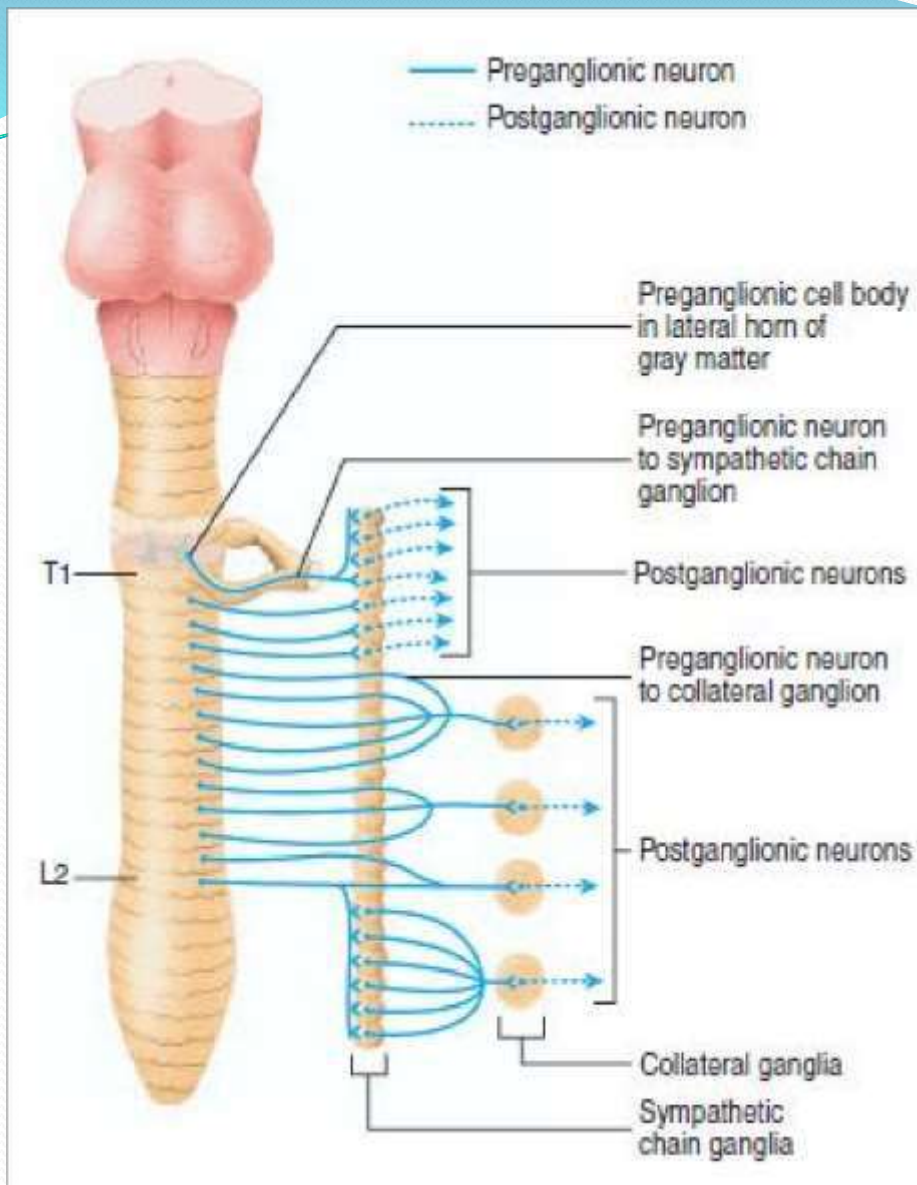
2. **Rectum:** causes relaxation of its wall and contraction of internal anal sphincter → **retention of feces.**   
 رجحير الرجاع للبول ما رخ يطرح رجح

الأعضاء التناسلية

3. **Sex organs**   
 para → erection (الانتصاب)

- I. It causes contraction of smooth muscle of seminal vesicle, **vas deferens and ejaculatory duct** → **ejaculation of semen.** → إخراج السائل المنوي

- II. It causes VC of blood vessels of pelvic viscera → **shrinkage of external sex organs e.g. penis.**



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



علس  
sympathetic  
علس

## (II) Functions of Parasympathetic NS

→ at the rest  
not stress.

### A) Cranial part

#### 1) Oculomotor nerve:

بخدي الحين -

**Origin:**

- **From midbrain.**

**Functions:**

- Causes contraction of constrictor pupillae muscle** → **narrowing of pupil (miosis)**  
تصيق في الجؤبؤ  
تحدن في العوسه
- Causes contraction of ciliary muscle** → **helps eyes to see near objects**

## 2) Facial Nerve

### Origin:

- From Pons

### Functions:

1. **Lacrimal glands:** <sup>الخدّة الدمعية</sup> **i) Vasodilatation.** **ii) Secretion of tears.**
2. **Submandibular and sublingual salivary glands:**
  - I. Vasodilatation.
  - II. **True salivary secretion (large in volume, watery, rich in electrolyte and poor in enzymes).** <sup>زيادة في secretion.</sup>



### 3) Glossopharyngeal Nerve:

#### **Origin:**

From medulla oblongata.

#### **Functions:**

الغدة التليية

#### **1. Parotid salivary gland**

- i) Vasodilatation.
- ii) True salivary secretion.

#### **A) Vagus (wandering) Nerve:** → thorax + abdomen بخري

#### **Origin:**

From the medulla oblongata.

#### **Functions:**

#### **A) Thorax:**

#### **a) Heart:**

- I. It decreases the heart rate, and force of contraction → قلب معدل ضربات القلب
- II. vasoconstriction of coronary vessels

## b) Lungs:

- I. Causes **bronchoconstriction**.
- II. **Increases the mucus secretion of the air passages.**

## B) Abdomen:

### a) GIT

- It causes contraction of their walls and relaxation of their **sphincters**.

عشمان يعجل عالية  
الهرجيم

### b) Glands

- Gastric glands → **↑es gastric juice secretion (rich in HCL).**
- **Pancreas: stimulates both endocrine and exocrine components**

عشمان يفرز  
الإنسولين  
دياقرى الهرمونات

c) **Liver:** *مصنع الألبومين  
يعمل تصفية*

- **It increases hepatic bile flow.**

d) **Gall bladder:**

- **Contraction of its wall and relaxation of sphincter of Oddi** → **helps**  
**its evacuation.**

e) **Blood vessels:**

- **Vasodilatation.** *توسع*

## B) Sacral part or outflow: (Pelvic Nerve)

### Origin:

- Sacral segments (2nd, 3rd, 4th) of spinal cord.

### Functions:

#### 1) Urinary bladder

بصير عليه تبرز / تبول

- It causes contraction of its wall and relaxation of internal urethral sphincter → micturition.

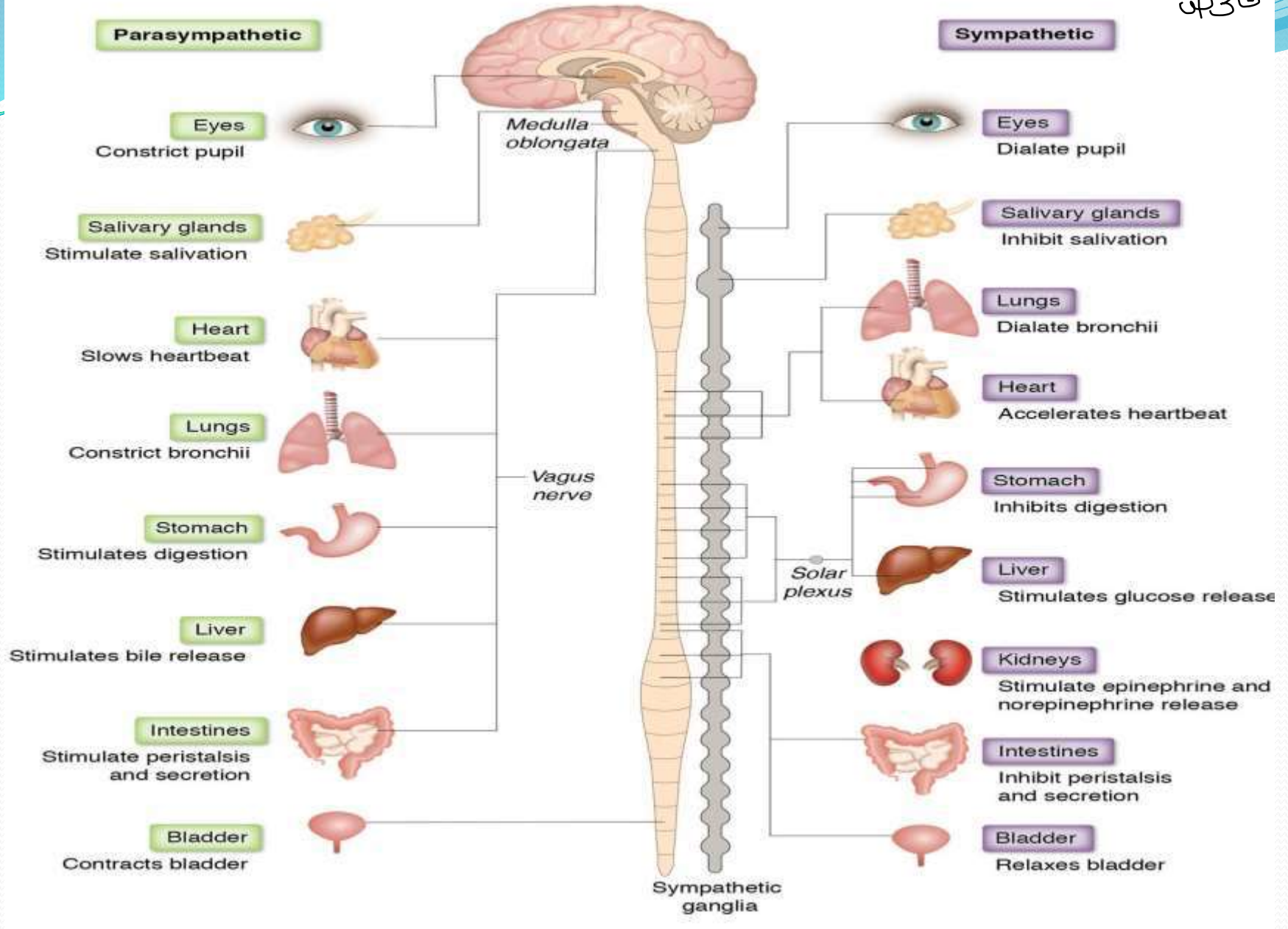
#### 2) Rectum

- It causes contraction of its wall and relaxation of internal anal sphincter → defecation.

#### 3) Sex organs

توسع له -> vd  
تضيق

- It causes ~~MM~~ of blood vessels of pelvic viscera → erection of the external sex organs e.g. penis



Summary of the functions of sympathetic and parasympathetic N.S.

## Chemical Transmission →

النقل  
الكيميائي

### Definition

connection

Synapse is **the functional connection between a neuron and second neuron**

### Types of Synapses:

• Two main types of chemical transmitters released by autonomic nerve endings:

- I. **Acetylcholine** → parasympathetic
- II. **Noradrenaline** → sympathetic

Accordingly, there are two types of autonomic nerve fibers,

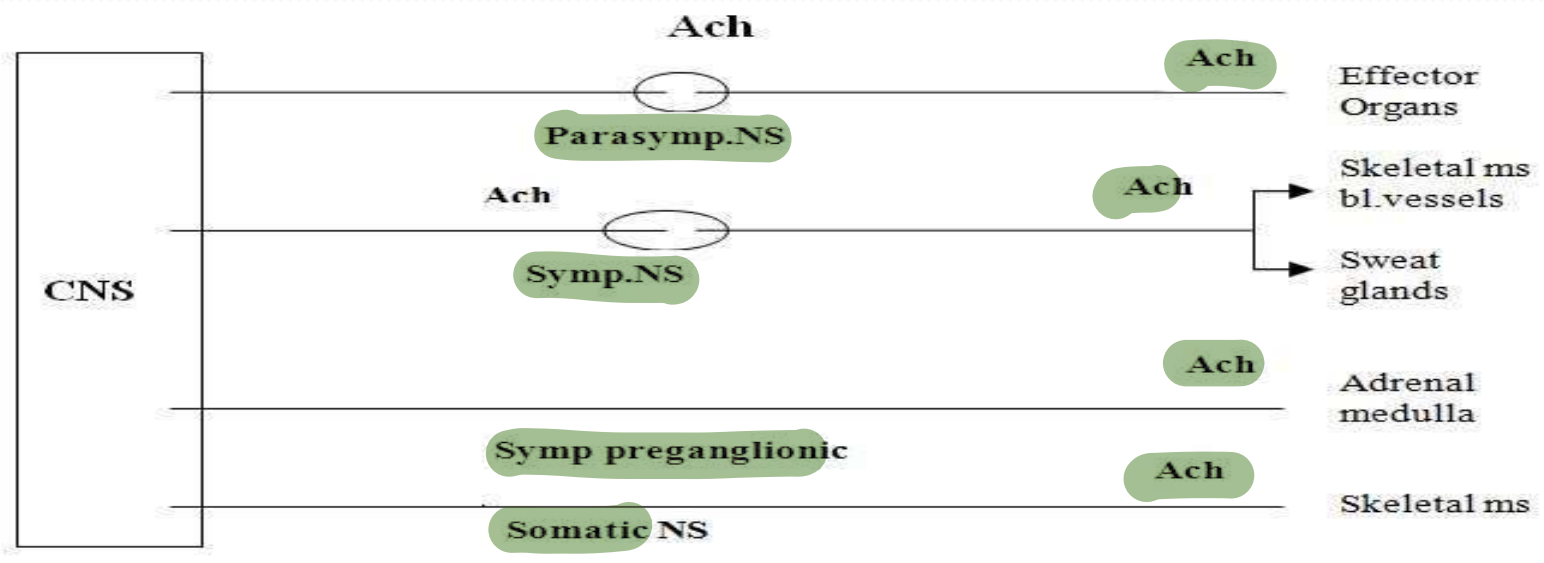
1. Cholinergic nerve fibers: **secrete acetylcholine.**
2. Adrenergic nerve fibers: **secrete noradrenalin.**



## Cholinergic Transmission

### A) Sites of release of Acetylcholine

1. All **preganglionic** sympathetic and parasympathetic NS nerve endings.
2. Preganglionic sympathetic nerve fibers **to suprarenal medulla**.
3. All postganglionic parasympathetic nerve ending.
4. **Somatic motor nerve ending** to skeletal muscle (motor end plate).
5. Some synapses at CNS (**brain and spinal cord**).



sites of release of acetylcholine

# Cholinergic Receptors receptors لما دحب بيتنا بل مع دحب آخر، يفوز نامل تويي في ، عشان يتحفظ لازم يكون عليه

## Definition

They are the receptors which respond to Ach.

## Types:

### **Muscarinic and nicotinic receptors of acetylcholine**

	<b>i) Muscarinic receptors</b>	<b>ii) Nicotinic receptors</b>
<b>Site</b>	<b>Present on smooth muscles and glands</b>	Present in autonomic ganglia and neuromuscular junction
<b>Types</b>	M1, M2, M3, M4 and M5	<b>Nn (nicotinic neuronal) and Nm (nicotinic muscular)</b>

عصبي فریجی

	<b>Muscarinic receptors (M-receptor)</b>	<b>Nicotinic receptors (N-receptor)</b>
<b>Locations</b>	smooth muscle, gland and cardiac muscle ●M--- smooth muscle, gland ●M1-- ganglia, gland ●M2--- heart	<b>skeletal muscle-- motor</b> ending-plate (N2 N2), ganglia-postsynaptic membrane(N1),
<b>Effect</b>	inhibiting the cardiac muscle, <b>exciting the smooth muscle &amp; gland</b>	<b>N2:exciting skeletal</b> muscle , N1 exciting the postsynaptic neuron in ganglia
<b>Antagonist</b>	<b>Atropine</b>	N1:hexamethonium N2:decamethonium

## Adrenergic Transmission

- **Noradrenaline and adrenaline are called catecholamines and released from**

### Sites of release of catecholamines:

1. **Postganglionic sympathetic fibers**
2. **Some synapses in CNS.**
3. **Suprarenal medulla: adrenaline (80%) and noradrenaline (20%).**

## Adrenergic Receptors

**Definition:** are the receptors which respond noradrenaline and adrenaline.

### Types :

They are classified into 2 major types:

س  
مخبر

i)  $\alpha$  (Alpha) adrenergic receptors (mostly excitatory)

They include many subtypes;

- $\alpha 1$  receptors
- $\alpha 2$  receptors

س  
مبدا

ii)  $\beta$  (beta) adrenergic receptors (mostly inhibitory)

They are further subdivided into:

$\beta 1, \beta 2, \beta 3, \beta 4, \beta 5$  receptors



Receptor	Major Effector Tissues	Major Functions
Alpha <sub>1</sub>	SM, sphincters الانقباض	Contraction (constriction),
Alpha <sub>2</sub>	Nerve endings	↓ Transmitter release تقليل من خروج الناقل العصبي
Beta <sub>1</sub>	Cardiac muscle, Kidney	↑ Heart rate and force, ↑ Renin secretion
Beta <sub>2</sub>	SM including bronchi Liver Skeletal muscle	Relax SM ↑ Gluconeogenesis, glycogenolysis ↑ Glycogenolysis and K <sup>+</sup> uptake
Beta <sub>3</sub>	Adipose	↑ Lipolysis تقليل الدهون
DA <sub>1</sub>	SM especially renal, mesenteric and cardiac	Relax renal vascular SM (higher doses activates β <sub>1</sub> and α <sub>1</sub> receptors)

X

Which is the number of spinal cord segments?

20 (a)

31 (b)

12 (c)

40 (d)

15 (e)

# Enumerate types of neurons

## Answer

- a. Afferent (sensory) neuron → carries impulses from receptors to CNS.
- b. Efferent (motor) neuron → carries impulses from CNS to effector organs.
- c. Interneuron (associative) → located entirely within CNS.

Define autonomic ganglia and mention its function and types •

## Answer

### 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

# Types of ganglia

## **a) Lateral (paravertebral) ganglia:**

- Located on either side of the spinal cord.
- About 22-24 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.

**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.

Which is a function of sympathetic nervous system to head and neck?

- Decreased sweat secretion (a)
- Vasodilatation of skin blood vessels (b)
- Watery salivary secretion (c)
- Mydriasis(dilatation of eye pupil)** (d)
- Ptosis of eye lid (e)



## Which is a function of sympathetic to thorax?

- Vasoilatation of pulmonary vessels (a)
- Bronchoconstriction (b)
- Increased effectiveness of the heart as a pump (c)
- Increased bronchial secretion (d)
- Vasoconstriction of coronary vessels (e)

Which is a function of sympathetic supply to abdomen?

**a-Relaxation of Gastrointestinal walls and contraction of the sphincters**

**b-↑es gastric juice secretion (rich in HCL).**

**c-stimulates both endocrine and exocrine components of pancreatic secretions .**

**d-It increases hepatic bile flow.**

**E- Contraction of wall of gall bladder and relaxation of sphincter of Oddi → helps its evacuation.**

# Mention function of sympathetic supply to pelvis and kidneys

## To pelvis

### **Origin:**

- LHCs of L1, L2, and L3 segments of spinal cord.

### **Functions:**

1. **Urinary bladder:** causes relaxation of its wall and contraction of internal urethral sphincter → retention of urine.
2. **Rectum:** causes relaxation of its wall and contraction of internal anal sphincter → retention of feces.
3. **Sex organs**
  - I. It causes contraction of smooth muscle of seminal vesicle, vas deferens and ejaculatory duct → ejaculation of semen.
  - II. It causes VC of blood vessels of pelvic viscera → shrinkage of external sex organs e.g. penis.

## To kidneys

- It decreases renal blood flow.
- It decreases urine output

# Mention origin and parasympathetic functions of facial nerve

## Answer

### Facial Nerve

#### **Origin:**

- From Pons

#### **Functions:**

1. **Lacrimal glands:** i) Vasodilatation. ii) Secretion of tears.
2. **Submandibular and sublingual salivary glands:**
  - I. Vasodilatation.
  - II. True salivary secretion (large in volume, watery, rich in electrolyte and poor in enzymes).

Which is the parasympathetic nerve which (a supply the thoracic and abdominal organs?

Glossopharyngeal (a

Vagus (b

Oculomotor (c

Pelvic (d

Sciatic (e

# Mention functions of parasympathetic nervous system to abdomen

**Answer:Abdomen:**

**a) GIT**

- It causes contraction of their walls and relaxation of their sphincters.

**b) Glands**

- **Gastric glands**→ ↑es gastric juice secretion (rich in HCL).

**Pancreas:** stimulates both endocrine and exocrine components pancreatic secretions .

**c) Liver:**

- It increases hepatic bile flow.

**d) Gall bladder:**

- **Contraction of its wall and relaxation of sphincter of Oddi** → helps its evacuation.

**e) Blood vessels:**

- **Vasodilatation.**



Which is the autonomic parasympathetic receptors present in smooth muscles and glands?

Adrenergic B1 receptors (a)

Cholinergic nicotinic receptors (b)

Adrenergic alpha 1 receptors (c)

Adrenergic B2 receptors (d)

**Cholinergic muscarinic receptors (e)**

Which is the autonomic receptors which its stimulation leads to increased heart rate and force?

Adrenergic B<sub>2</sub> (a)

Adrenergic alpha<sub>2</sub> (b)

Cholinergic nicotinic (c)

Adrenergic B<sub>1</sub> (d)

Cholinergic Alpha 1 (e)

Which is the autonomic receptors which its stimulation leads to contraction of sphincters?

Cholinergic muscarinic (a)

Adrenergic Alpha 1 (b)

Adrenergic alpha2 (c)

Cholinergic nicotinic (d)

Adrenergic B2 (e)



Thank

You●