FOUNDATION BLOCK

ANATOMY

INTRODUCTION TO ANATOMY
LECTURE-1-

OBJECTIVES

At the end of the lecture, students should be able to:

- **Define the word "Anatomy"**
- **Enumerate the different anatomical fields**
- **Describe the anatomical position**
- **Describe different anatomical terms of position & movements as well different anatomical planes**
- **Classify bones according to shape, structure & development**
- **Enumerate different bones of both axial & appendicular skeleton**

Anatomy : The Science which deals with the study of the structure and shape of the body .

Some Anatomy Terms

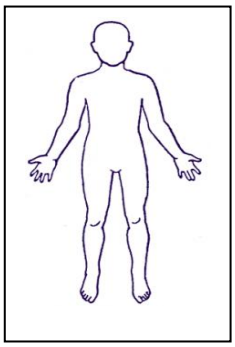
- **Gross Anatomy**
- **Microscopic Anatomy**
- **Developmental Anatomy**
- **Radiological Anatomy**
- **Surgical Anatomy**
- **Cross-sectional Anatomy**
- **Applied Anatomy**

Anatomical Position

Body is erect

Arms hanging by the sides

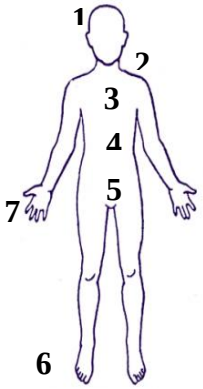
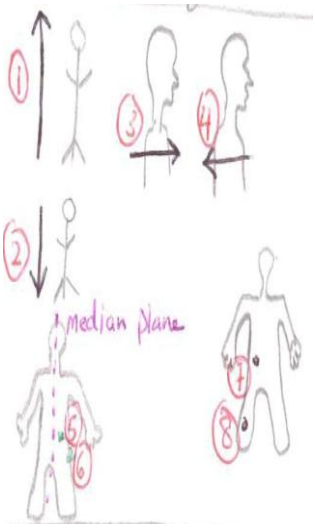
Feet parallel



Palms facing Forward

Anatomical Terminology

1. Cranial
2. Abdominal
3. Cervical
4. Planter
5. Thoracic
6. Palmer
7. Pelvic

Terms according to :	Description	Illustration
Regions	1- Cranial 2- Cervical 3- Thoracic 4- Abdominal 5- Pelvic 6- Planter 7- Palmer	
Position	1- superior (cranial, rostral) 2- Inferior (Caudal) 3- Anterior (ventral) 4- Posterior (dorsal) 5- Medical 6- Lateral 7- Proximal 8- Distal 9- Superficial 10- Deep	
Movement	1- Flexion 2- Extension 3- Abduction	1- decreasing the angle between two parts . 2- inecreasing the angle between two parts . 3- away from median plane .

	4- Adduction	4- towards median plane .
	5- Lateral rotation	5- rotation away from median plane .
	6- Medical rotation	6- rotation toward median plane .
	7- Circum duction	7-flexion , extension , adduction and abduction .
	8- Opposition	8- bringing tips of fingers and thump .

Some Anatomy Terms

Sagittal Section

- Dividing the body into right and left parts .

Frontal Section

- Dividing the body into anterior and posterior parts

Transverse Section

- Dividing the body into superior and inferior parts

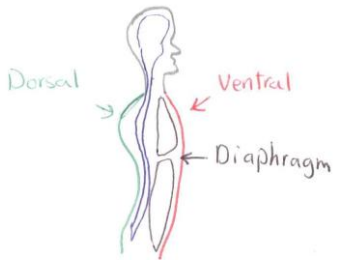
Body Cavities

1- **Dorsal** :
   A- Cranial Cavity
   B- Spinal Cavity

Continuous with each other

2- **Ventral :**
   A- Thoracic Cavity
   B- Abdominopelvic Cavity

Separated from each other by the diaphragm



Skeletal System	Classification of Bones
- Bones - Joints (articulations)	- Shape : long , short , flat , irregular . - Structure : compact , spongy . - Development : membrane , cartilage .

Structure of a long bone

1- Diaphysis : Compact bone

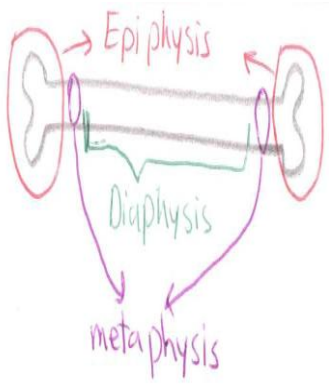
- Covered by periosteum .
- Has marrow cavity .

2- Epiphysis :

- Spongy bone .
- Covered by articular cartilage .
- Function of articular cartilage is to decrease friction at joint surfaces .

3- Metaphysis :

- Contain (epipyseal plate)
- Function of epipyseal plate is for the length growth of the long bones .



Role of Periosteum :

1- Protects the bone .

2- Gives attachment to muscles .

3- Carries blood vessels and nerves to bone .

4- Deposits new bone on the surface thus increases the girth of bone .

The Skeleton

- 206 bones in our body .
- The skeleton is perfectly adapted to the functions of body (protection and motion) .
- Subdivided into two divisions :

  1- Axial skeleton : Axis of the body .

  2- Appendicular skeleton : bones of limbs and gridles .

- Examples of Appendicular Skeleton one :

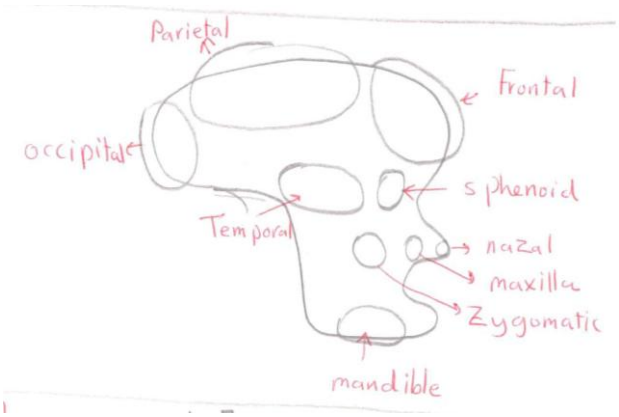
  1- Pectoral and pelvic gridles .

  2- Upper and lower limbs .

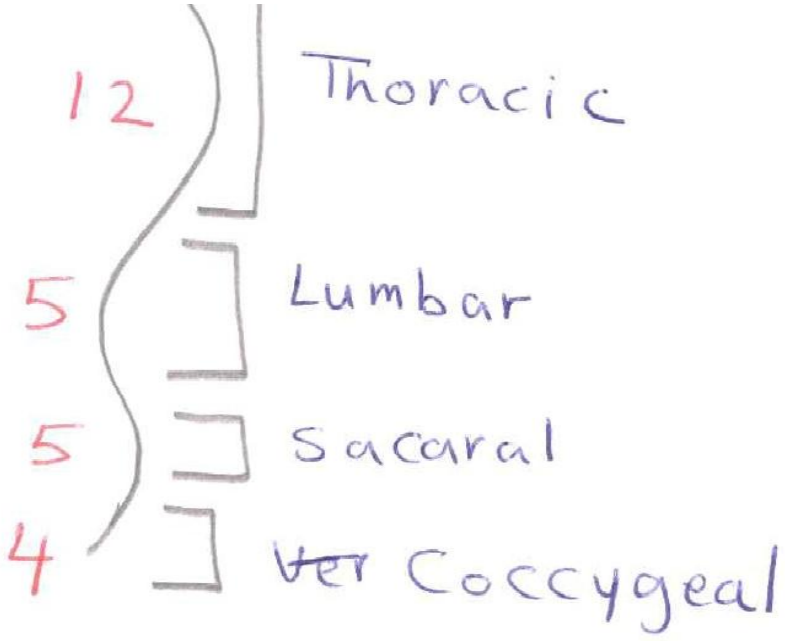
Skull bones

1- Cranium .

2- Facial bones .



Vertebral Column



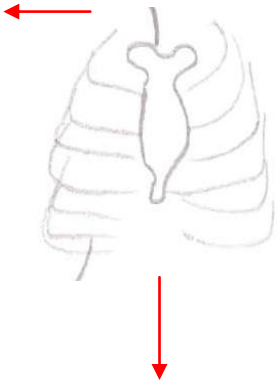
Sternum

Flat bone .

Manubrium

Body

Xiphoid process



Ribs

- 12 pairs .
- Articulate with vertebrae except upper 7 pairs articulate with sternum.

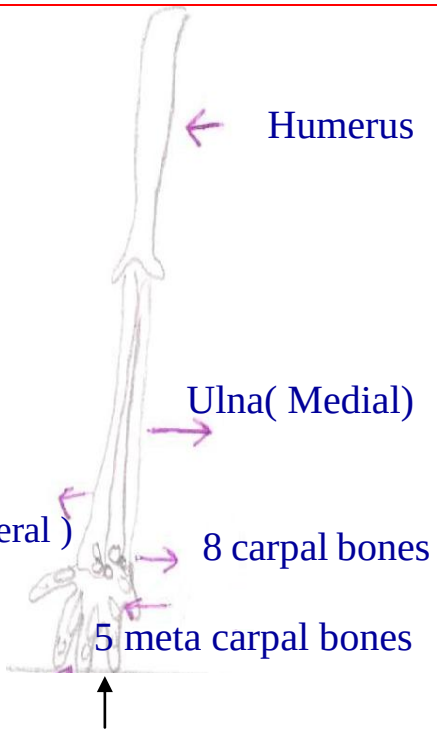
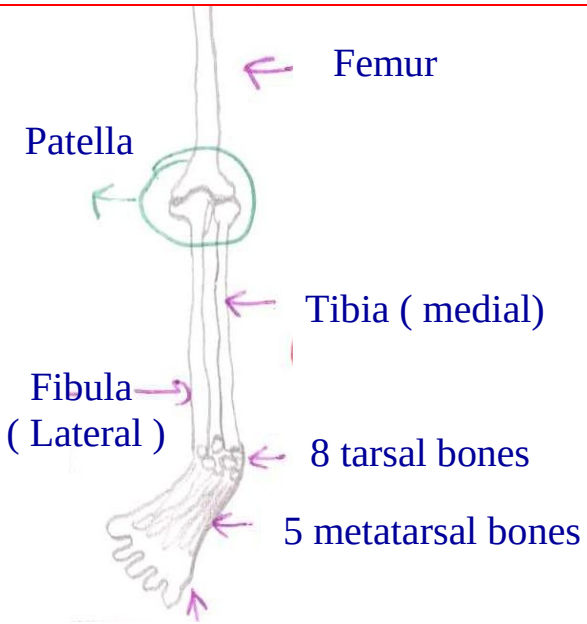
Bones of the Girdles

Pectoral Girdle : bones connecting the upper limb with the axial skeleton .

- Clavicle .
- Scapula .

Pelvic Girdle : bones connecting the lower limb with the skeleton .

- Two hip bones .

Bones of the upper limb	Bones of the lower limb
 14 phalanges : 2 for thumb and 3 for each of medial 4 fingers.	 14 phalanges : 2 for big toe and 3 for each of lateral 4 toes .

FOUNDATION BLOCK

ANATOMY

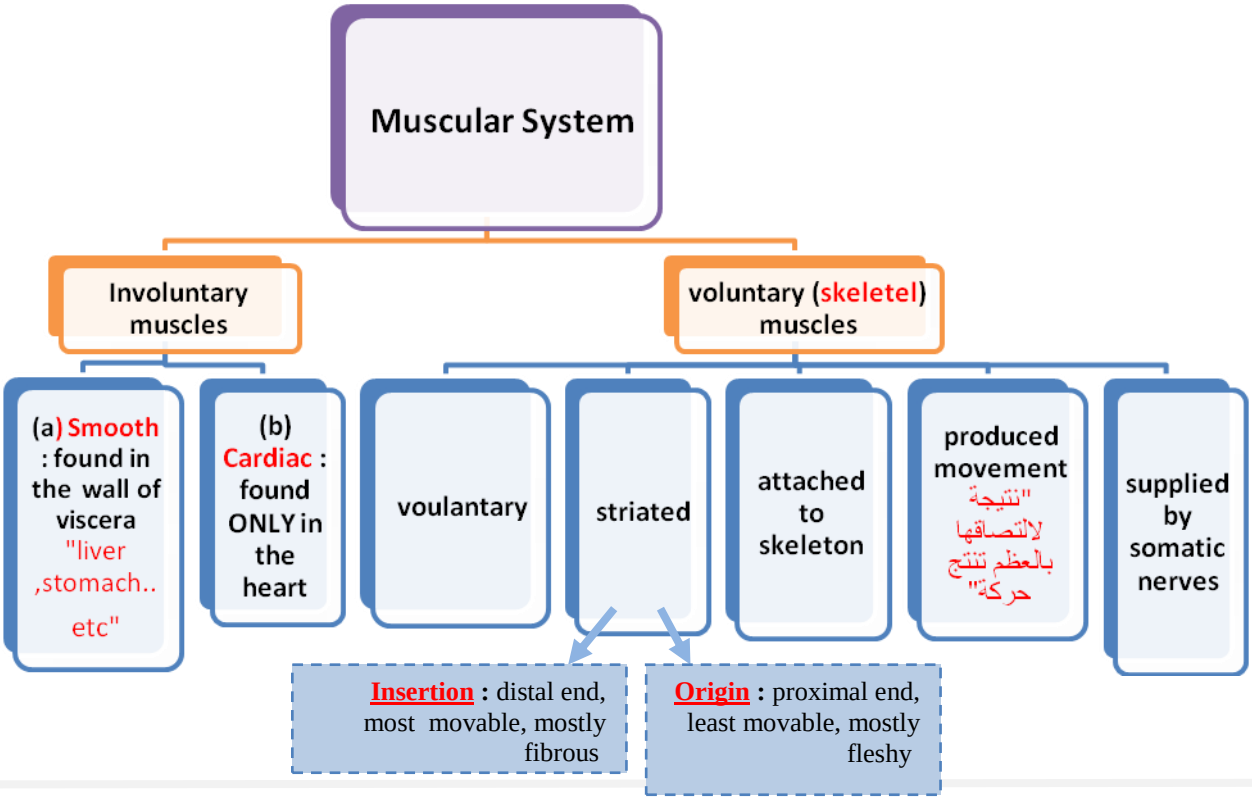
SKELETAL MUSCLES

LECTURE -2-

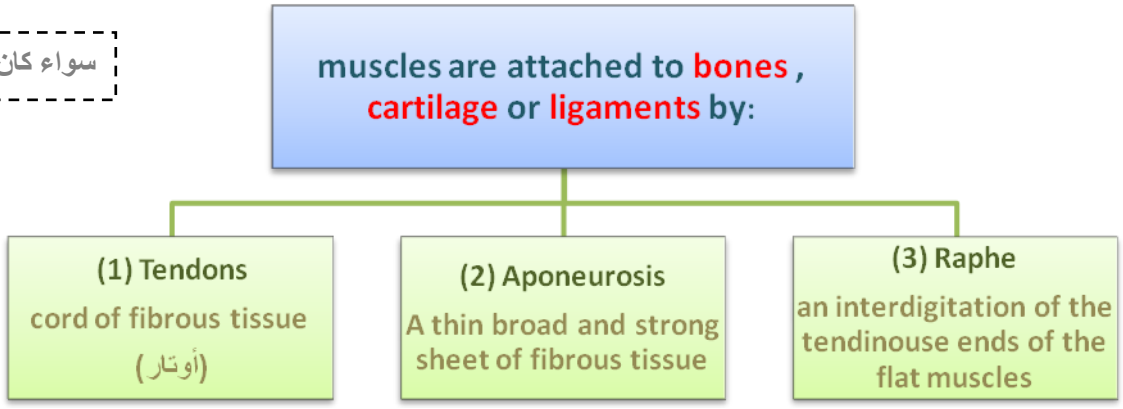
OBJECTIVES

At the end of the lecture, students should be able to describe:

- ***the main criteria of skeletal muscles.***
- ***the attachments of skeletal muscles.***
- ***the different directions of skeletal muscle fibers.***
- ***the mode of action of skeletal muscles.***
- ***Nomenclature of skeletal muscles.***
- ***The nerve supply of skeletal muscles.***



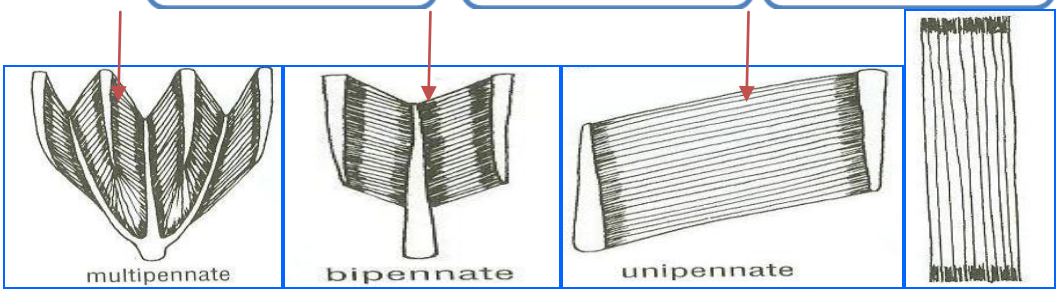
سواء كان origin أو insertion



direction of muscles fiber

*muscles are a group of muscle fiber

- **parallel to body midline**
  - less powerful
  - more range of movement
- **pennate or penniform muscle (oblique to body midline)**
  - more powerful
  - less range of movement
  - **unipennate** *(some muscles in hands)*
  - **bipennate** *(quadriceps muscle)*
  - **multipennate** *(Deltoid muscle)*



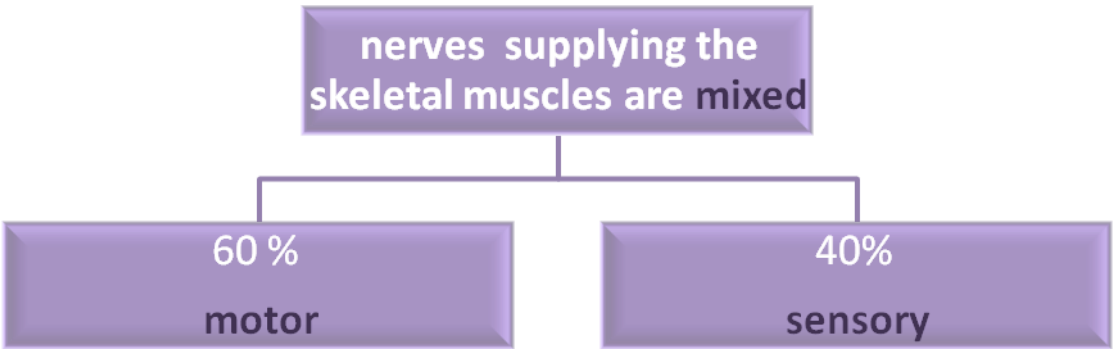
mode of action

- **- prime mover (agonist)**
  العضلة التي تقوم بالحركة.
  "العضلة المسؤولة عن حركة معينة لو لم توجد هذه العضلة لـ انعدمت هذه الحركة"
  Example :
  Quadriceps Femoris is the prime mover for extension of the knee joint.
- **- antagonist**
  العضلة التي تعاكس حركة prime mover
  ويجب أن تكون relaxede
  من أجل أن الـ prime mover تتحرك
  Example :
  Biceps Femoris (Flexor of knee) opposes the action of quadriceps when the knee joint is extended.
- **- synergist**
  تمنع الحركة الغير مرغوب فيها والتي تمر بها عضلة الـ "prime mover"
  Example :
  Flexors and Extensors of wrist joint contract to fix wrist joint in order that flexors and extensors of fingers work efficiently.
- **- fixator**
  لا تقوم بالحركة بنفسها ولكن تستقر في مكانها لـ تساعد الـ prime mover أن يقوم بعمله
  Example :
  Muscles attaching the shoulder girdle to the trunk contract to fix shoulder girdle, allowing deltoid muscle (taking origin from shoulder girdle) to move shoulder joint (humerus).

Antagonist "**working**" → Prime mover (agonist) "**working**"


Naming The Muscles
SIZE
major or maximus • (large)
minor or minimus • (small)
latissimus (broad)•
longus (long)•
brevis (short)•
SHAPE
deltoid (triangular)•
teres (rounded)•
rectus (straight)•
ACTION
flexor digitorum • (flexion of digit)
ATTACHMENTS
coracobrachialis • (from coracoid to arm)
POSITION
pectorials • (pectorial region)
NUMBER OF HEAD
biceps (2 heads)•
triceps (3 heads)•
quadriceps (4 • heads)
DEPTH
superficialis • (superficial)
profundus (deep)•
externus (external)•

Nerve supply



- It contains some autonomic fibers (sympathetic)

- The nerve enters the muscle at about the middle point of its deep surface.

SUMMARY

- ***Skeletal muscles are striated, voluntary muscles attached to & move the skeleton.***
- ***They have 2 attachments: origin & insertion.***
- ***Their fibers may be parallel or oblique (pennate) to the line of pull.***
- ***According to mode of action, they are classified as: Prime mover, Antagonist, Synergist or Fixator.***
- ***They may be named according to: size, shape, number of heads, position, attachments, depth or action.***
- ***They are supplied by mixed nerves.***

FOUNDATION BLOCK

ANATOMY

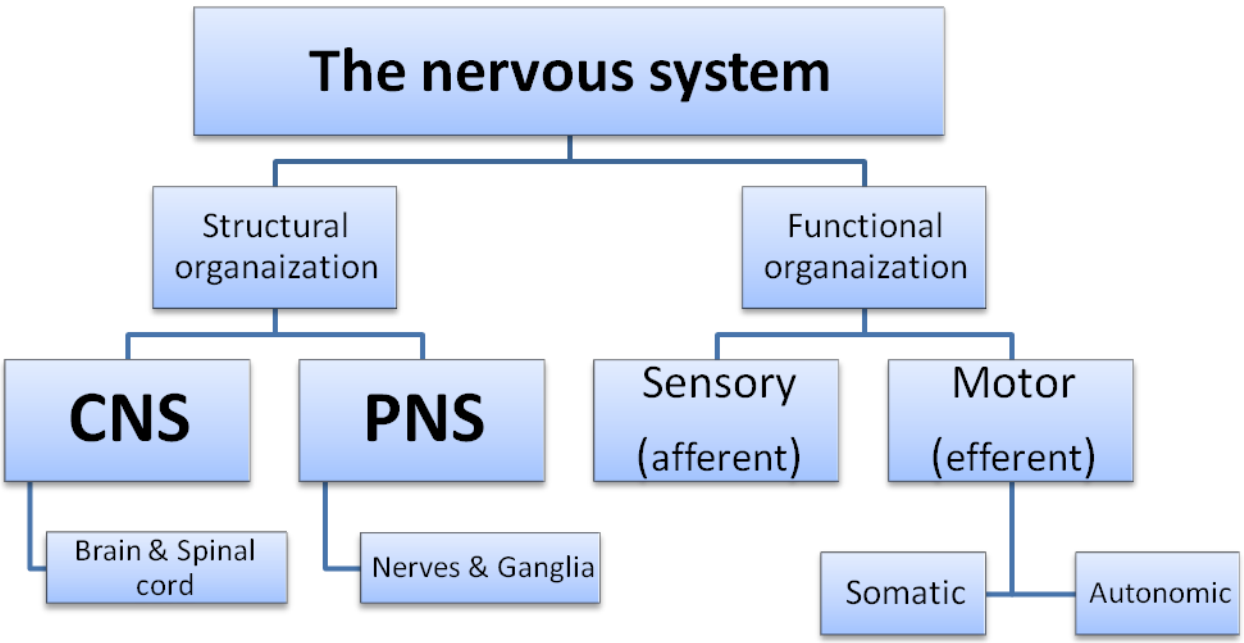
NERVOUS SYSTEM

LECTURE -4-

Objectives

At the end of the lecture, the students should be able to:

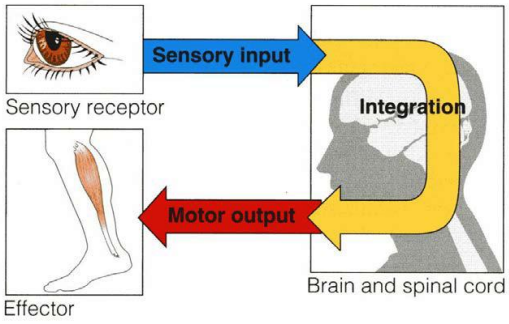
- ***List the subdivisions of the nervous system***
- ***Define the terms: grey matter, white matter, nucleus, ganglion, tract and nerve.***
- ***List the parts of the brain.***
- ***Identify the external and internal features of spinal cord.***
- ***Enumerate the cranial nerves***
- ***Describe the parts and distribution of the spinal nerve.***
- ***Define the term 'dermatome'***
- ***List the structures protecting the central nervous system***

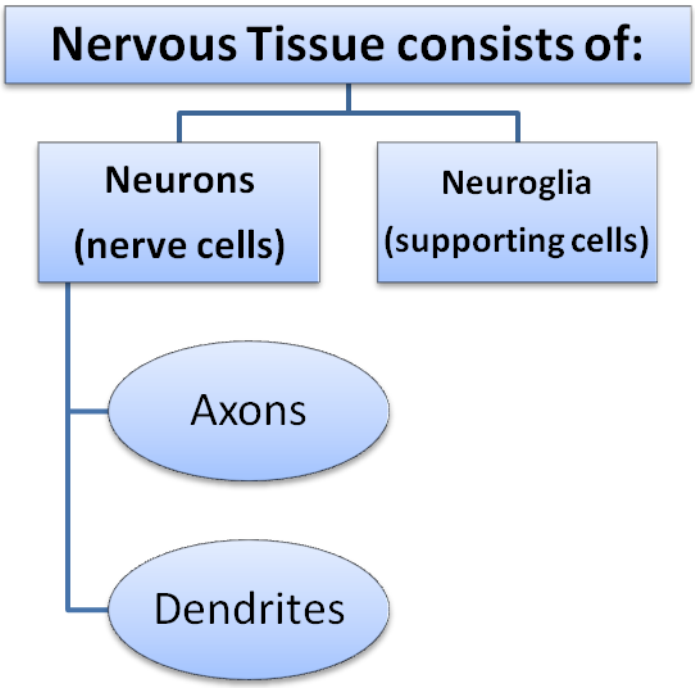


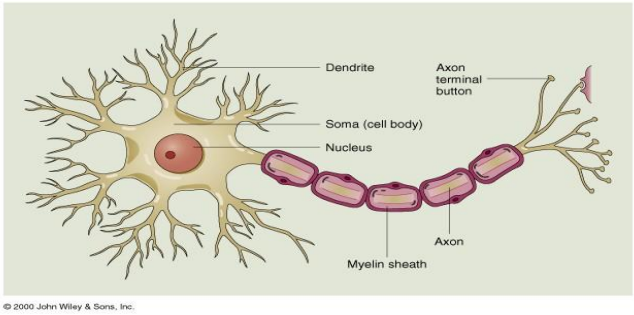
Functions:

1. **Collection of sensory input** → collects changes (stimuli) happening inside and outside the body by using "sensory receptors".
2. **Integration** → processes, analyses and interprets these changes then makes decisions.
3. **Effecting responses** → By activating muscles or glands (effectors) via "motor output"

-The picture below summarizers the functions:



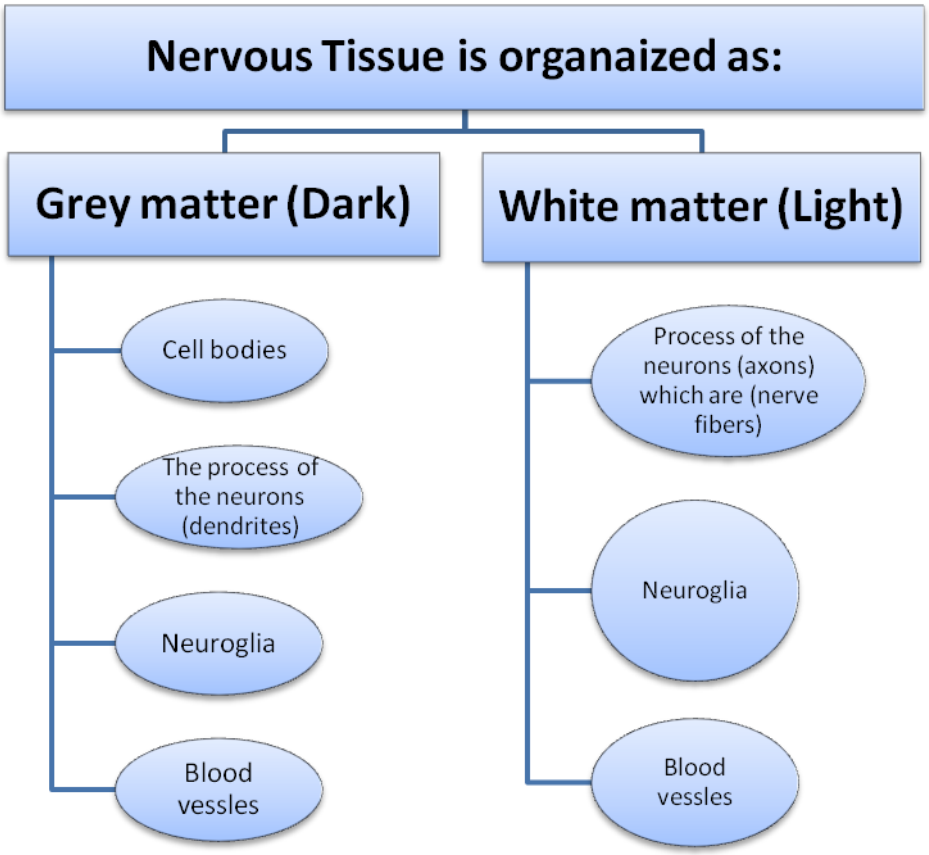




Comparison

Not mentioned in the slides but said by the doctor in the lecture

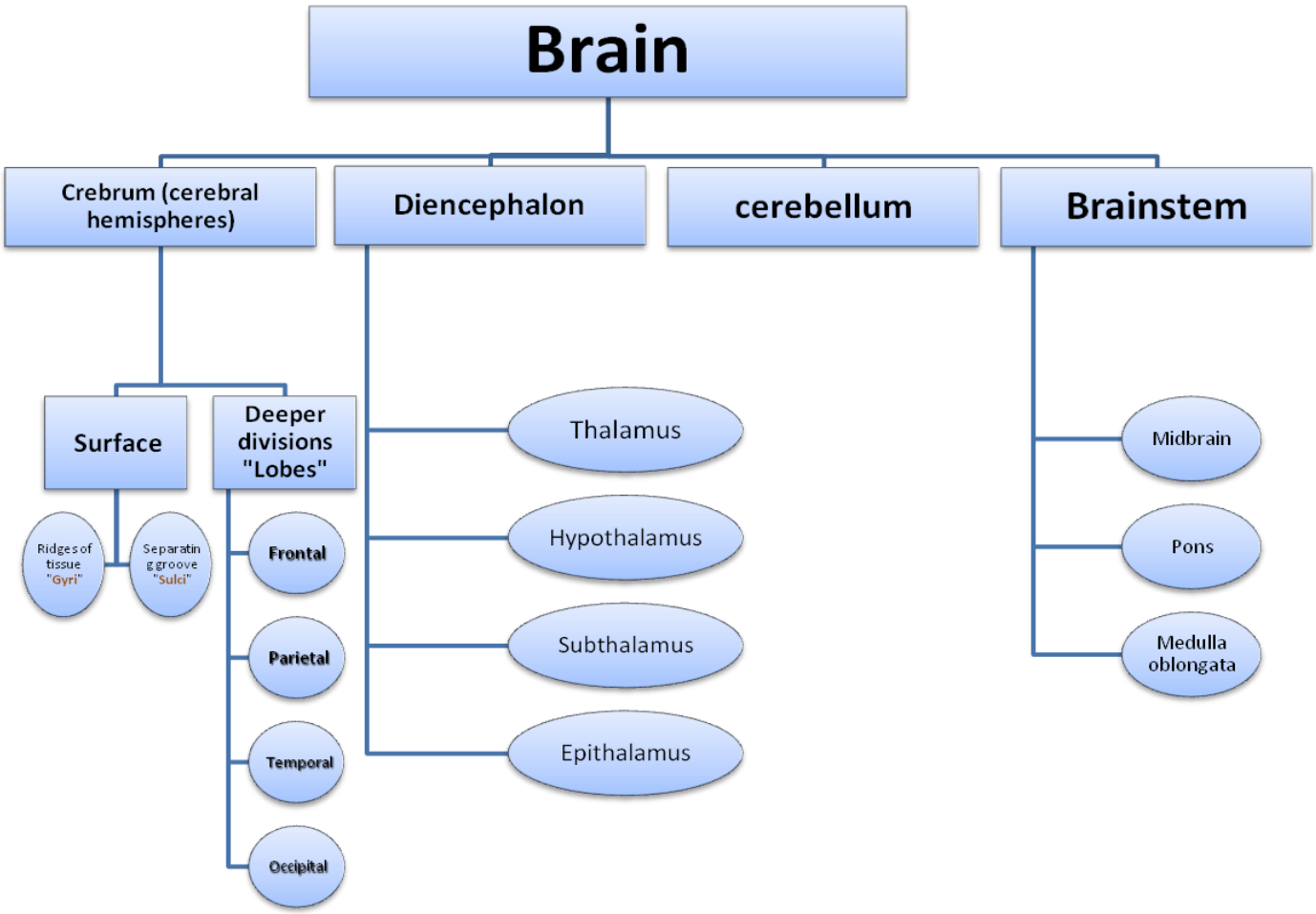
Dendrites	Axons
Short	Long
Branched	Not branched
Multiple	Single
Function: Collect information from other neurons to cell body.	**Function:** transports information to other neurons.



Note said by the doctor: the nerve fibers (axons) of the white matter are covered by "myelin sheets" (white coating) which gives the white matter its light appearance.

Names change according to the location

	Inside the CNS	Outside the CNS
Neurons	**Nucleus**	**Ganglion**
Nerve fiber (axons)	**Tract**	**Nerves**


Brain
Crebrum (cerebral hemispheres)
Diencephalon
cerebellum
Brainstem
Surface
Deeper divisions "Lobes"
Ridges of tissue "Gyri"
Separating groove "Sulci"
Frontal
Parietal
Temporal
Occipital
Thalamus
Hypothalamus
Subthalamus
Epithalamus
Midbrain
Pons
Medulla oblongata

Brain

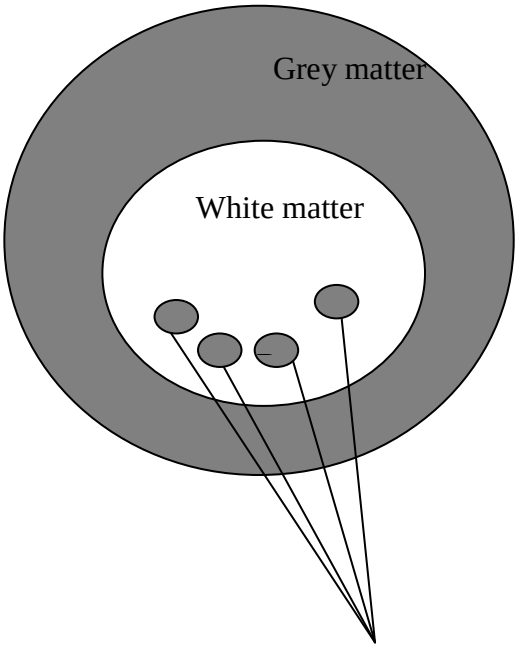
Cerebrum:

- The largest part of the brain, has two hemispheres
- The cerebral hemispheres are connected by a thick bundle of nerve fibers called "corpus callosum".

- **Tissue of cerebral hemispheres:**

Outer layer → **Grey matter** "cortex"
Inner layer → **White matter** ***composed of** fiber tracts (bundles of nerve fibers)
their function is to carry impulses to and from the cortex.
*Located deep within the White matter are masses of Grey matter called the basal nuclei. **Their function is** to help the motor cortex in the regulation of voluntary motor activities.

Please go back to the slides to see real pictures of the cerebral hemispheres. This is just a simple shape to make it easier for you to imagine.



Basal nuclei

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**. **Its function is 1-**to provide precise coordination for body movements **2-**helps maintain equilibrium.

Spinal cord

- It is a two-way conduction pathway to the brain & a major reflex center
- 42-45 cm long, cylindrical in shape, lies within the vertebral canal.
- Extends from **foramen magnum** (large opening in the occipital bone of the cranium) to **L2 vertebra.**
- Continuous above with **medulla oblongata.**
- Caudal tapering end is called **conus medullaris.**
- Has 2 enlargements: **cervical** and **lumbosacral.** **Why?** Because the cervical and the lumbosacral regions of the spinal cord supply the upper and lower limbs with nerves "Not mentioned in the slides but said by the doctor"
- Gives rise to 31 pairs of **spinal nerves**.
- Group of spinal nerves at the end of the spinal cord is called **cauda equine.**

Cross section of the spinal cord:

Division	Anterior	Posterior
• The spinal cord is incompletely divided into two equal parts	• a short, shallow **median fissure**	• deep narrow septum, the **posterior median septum.**

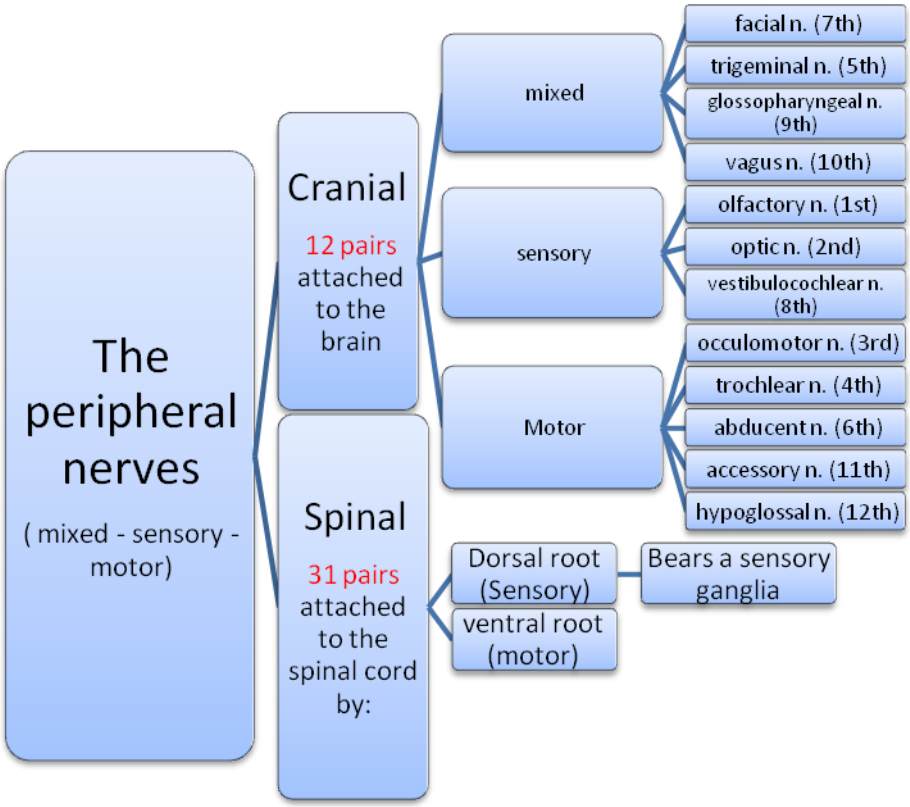
- Incompletely divided into two equal parts:

1. Anteriorly: short and shallow → **Anterior median fissure**.
2. Posteriorly: Deep and narrow → **Posterior median septum.**

- **It is composed of Grey matter** in the centre surrounded by **White matter**. "the opposite of the brain"

- The arrangement of **Grey matter** resembles the shape of the letter H, having **two posterior**, **two anterior** and **two lateral** horns/columns.

Remember!
The Brain: The White matter is inside and the gray matter is outside.
The Spinal Cord: The white matter is outside and the gray matter is inside



Spinal nerves:

- Each spinal nerve exits from the intervertebral foramen and divides into:
  1. Dorsal rami → distributed individually, **supply** the skin and muscles of the back.
  2. Ventral rami → form **Plexuses** (EXCEPT in thoracic region where they form the **Intercostal nerves**), **supply** the anterior part of the body.
- The rami contain both sensory and motor fibers.

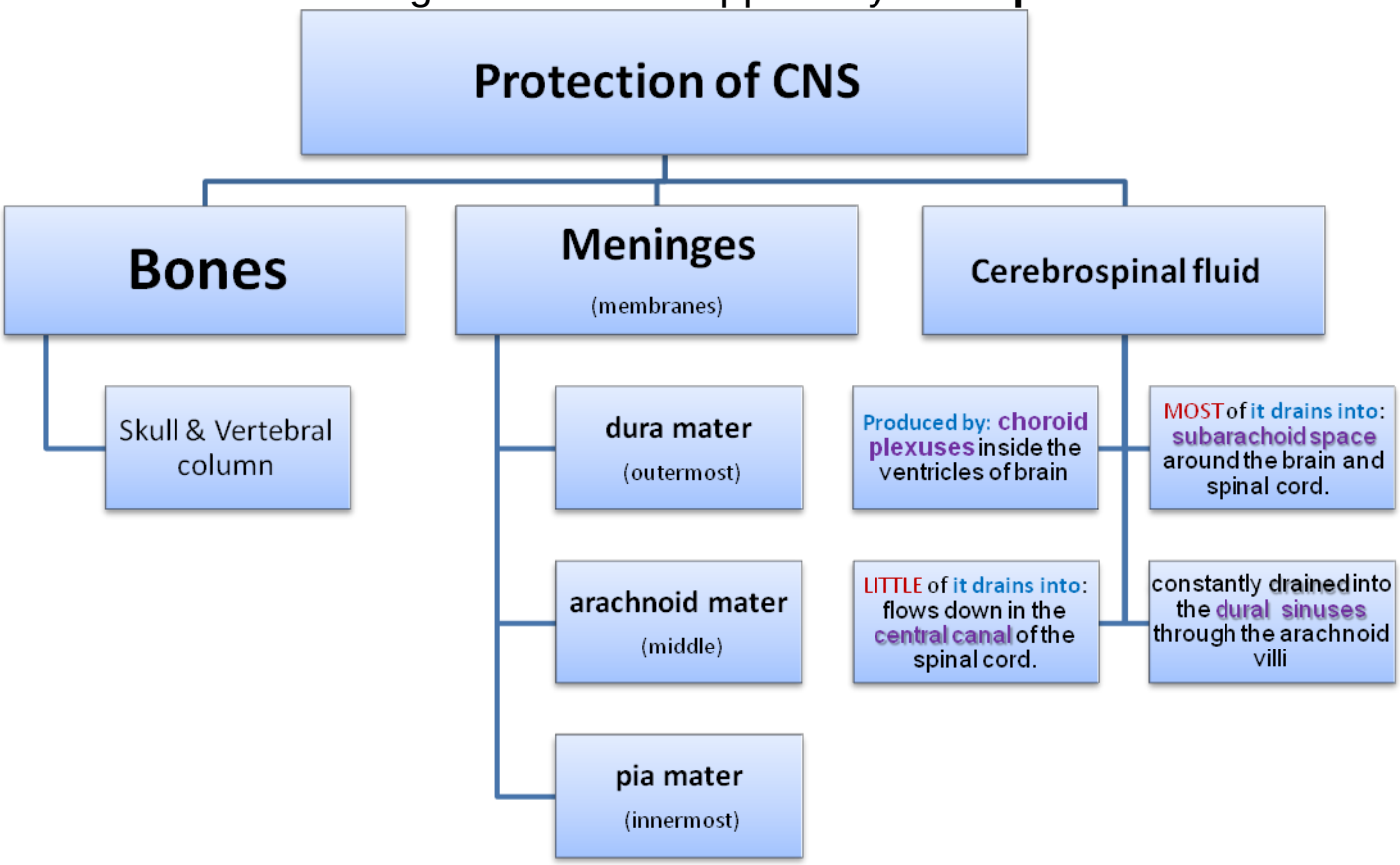
1st	**Olfactory**	**Sensory**
2nd	**Optic**	**Sensory**
3rd	**Occulomotor**	**Motor**
4th	**Trochlear**	**Motor**
5th	**Trigeminal**	**Mixed**
6th	**Abducent**	**Motor**
7th	**Facial**	**Mixed**
8th	**Vestibulocochlear**	**Sensory**
9th	**Glossopharyngea**	**Mixed**
10th	**Vagus**	**Mixed**
11th	**Accessory**	**Motor**
12th	**Hypoglossal**	**Motor**

***Note mentioned in the slides but said by the doctor*:**

- Nerve fiber: Can only be either sensory, or motor.
- Nerve(bundle of nerve fiber): Can be mixed.

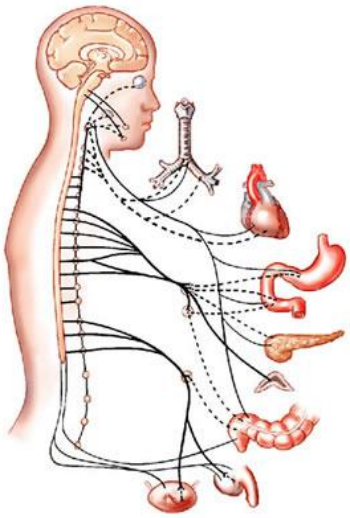
Dermatomes

The segment of skin supplied by **one spinal nerve.**



Vocabulary:
Stimuli: Motivation, boost.
Afferent: Inward or toward something
Efferent: Outward or away from something
Plexuses: A network of nerves or vessels in the body.

ANATOMY



Autonomic Nerves system

ANS

LECTURE -5-

OBJECTIVES

At the end of the lecture, students should:

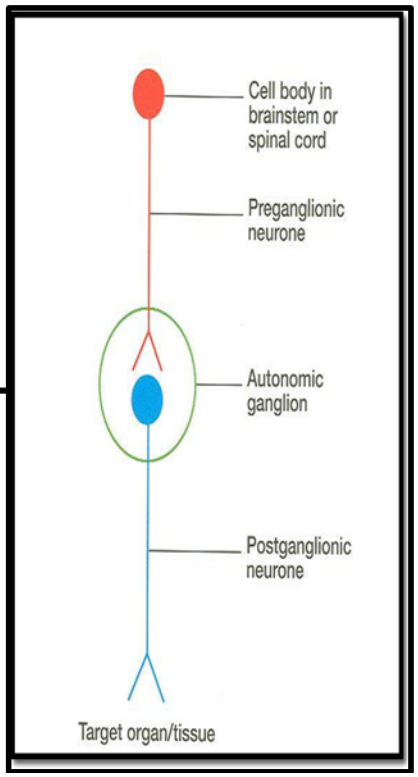
- ***Define the autonomic nervous system.***
- ***Describe the structure of autonomic nervous system***
- ***Trace the preganglionic & postganglionic neurons in both sympathetic & parasympathetic nervous system.***
- ***Enumerate in brief the main effects of sympathetic & parasympathetic system***

- ***Somatic cell bodies are in the ventral horn while the autonomic cell bodies are in the lateral.***

	Somatic motor system	Autonomic motor system
Effector	Skeletal muscle	Cardiac muscle, smooth muscle, glands
Type of control	Voluntary	Involuntary
Neural pathway	One motor neuron extends from the CNS to skeletal muscle	Chain of two motor neurons: Preganglionic & Postganglionic neuron
Action on effectors	Always excitatory	May be excitatory or inhibitory
Neurotransmitter	Acetylcholine	Acetylcholine or norepinephrine
Rate of conduction	Rapid due to myelinated axons	Slower due to thinly myelinated or unmyelinated axons

Autonomic Nervous System(ANS)

Structure



Function

maintains homeostasis of internal environment

Regulation

by hypothalamus

Types

SYMPATHETIC

PARASYMPATHETIC

ANS controled of visceral organs, smooth muscles and glands.

- Sensory neurons receive impulses, motor send, and interneurons connect the sensory and the motor.

- Receptors are specific cells that identify stimuli
- Receptors are sensitive towards:

a) Chemical substances → Chemoreceptors
b) Pressure → Baroreceptors
c) Osmolality →Osmoreceptors.

Nerve cells located in both central&peripheral nervous system that are concerned with innervation of involuntary

- Synapse is when two neurons meet together. There is always a gap between the two When an impulse travels and reaches this gap, the pre-synapse neuron releases a chemical substance that called a neurotransmitter to bridge the gap between the two neurons.

	SYMPATHETIC NERVOUS SYSTEM	PARASYMPATHETIC NERVOUS SYSTEM
Preganglionic neurons	Formed in **lateral horn of spinal cord in all T1-L3(thoracic + upper 3 lumbar segments مسمى اخر)(Thoracolumbar outflow**	Formed in 2 places: 1- **Cranial: cells in brain stem: nuclei of 3rd, 7th 9th& 10th** 2- **Sacral: cells in S2 – S4 segments of spinal cord(lateral horn) in the grey matter.**
Preganglionic axons	1- Short. 2- **synapses with many postganglionic neurons that pass to many visceral effectors** Have 2 types: A- **Join corresponding spinal nerves & reach the sympathetic chain .** B- **Leave the sympathetic chain without synapse to join with coeliac & mesenteric plexuses (around branches of abdominal aorta) cells** **s supply abdominal & Pelvic viscera.'It** 3- **Run in the ventral rootthen join the sympathetic chain via the white rami communicans. (myelinated axons) (WRC)**	1- Long **2 synapses with four or five postganglionic neurons that pass to a single visceral effector** 2 types: **A- leave the brain stem, join 3rd, 7th, 9th& 10th cranial nerves & reach ciliary, pterygopalatine, submandibular, otic& peripheral ganglia.** **B- leave the spinal cord, join corresponding sacral spinal nerves to reach peripheral ganglia in pelvis where they synapse.**
Postganglionic neurons	We find them in 2 places ac: 1- **In paravertebral ganglia (in sympathetic chain.** 2- **in coeliac & mesenteric plexuses.**	According the locations of **Preganglionic neurons, We have 2 types:** **1- Cranial** **2- Sacral**
Postganglionic axons	1- Long 2- Have 2 types: A- **leave the sympathetic chain & join again the spinal nerve to supply *structures in head & thorax + blood vessels & sweat glands.*** B- **Postganglionic axons supply *abdominal & pelvic viscera.*** **3- Enter back into the spinal nerve through grey rami communicans (GRC) (nonmyelinated axons)**	1- Short 2- 2 types : A- **supply*structures in head, thorax & abdomen.*** B- **supply*pelvic viscera.*** ملاحظة: اسماء الـ Ganglion في الـ Cranialمهمه نظرا لان الدكتور مركز عليها وايضا الاعضاء اللي تغذيها. الاسماء في الصورتين في الاسفل.

The **Sympathetic Ganglia divided in 2 types**

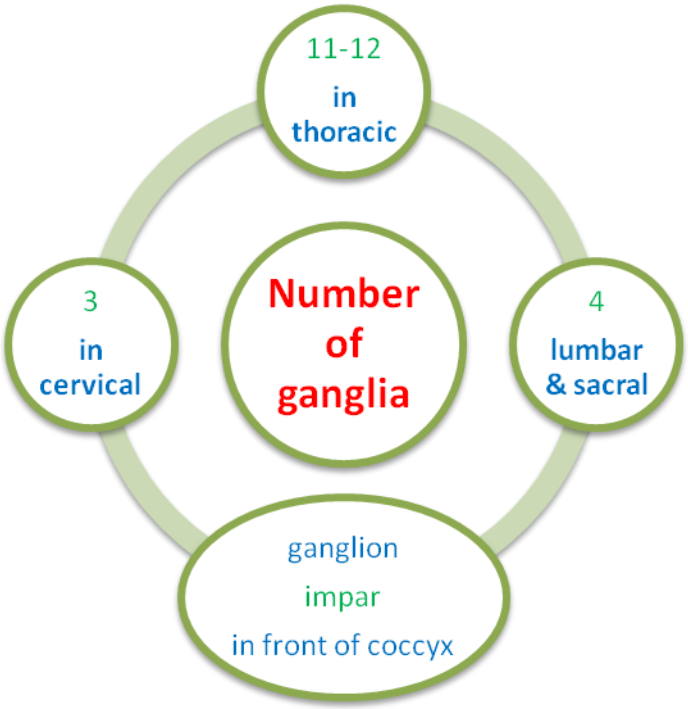
- **Prevertebral:Unpaired, not segmentally arranged located in abdomen.**

Main ganglia :Celiac , Superior mesenteric , Inferior mesenteric , Aorticorenal

- **Paravertebral**

PARAVERTEBRAL GANGLIA

- **They are interconnected to form 2 sympathetic chains, one on each side of vertebral column**



Impar : كلمة لاتينيه تعني (مفرده)

Nucleus: **group of neurons inside CNS**
Ganglion: **group of neurons outside CNS**

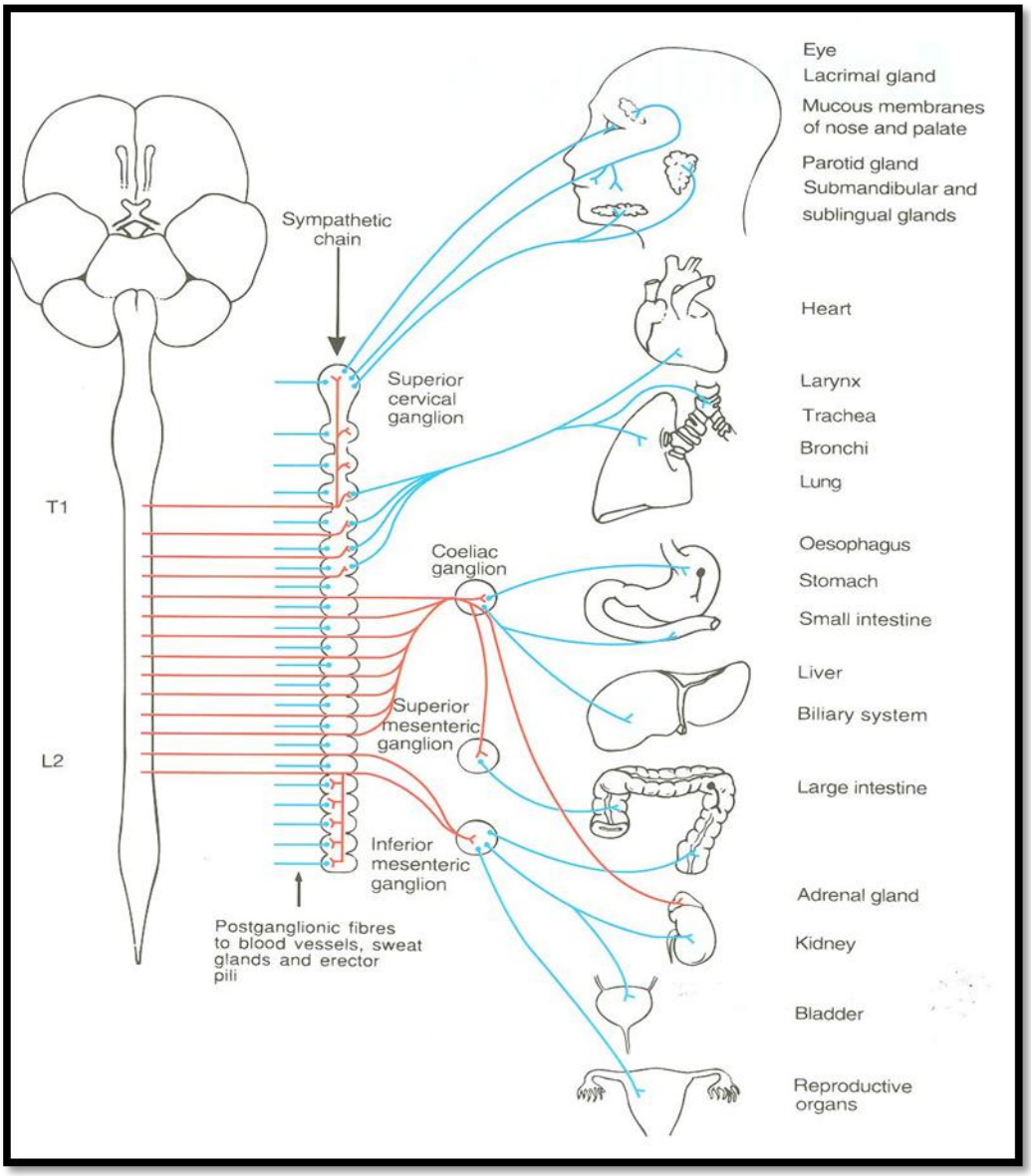
Neurotransmitter of the Autonomic Nervous System

preganglionic axons : Acetylcholine for both divisions (cholinergic)
postganglionic axons : 1- Sympathetic: mostly norepinephrine 2- Parasympathetic: acetylcholine.

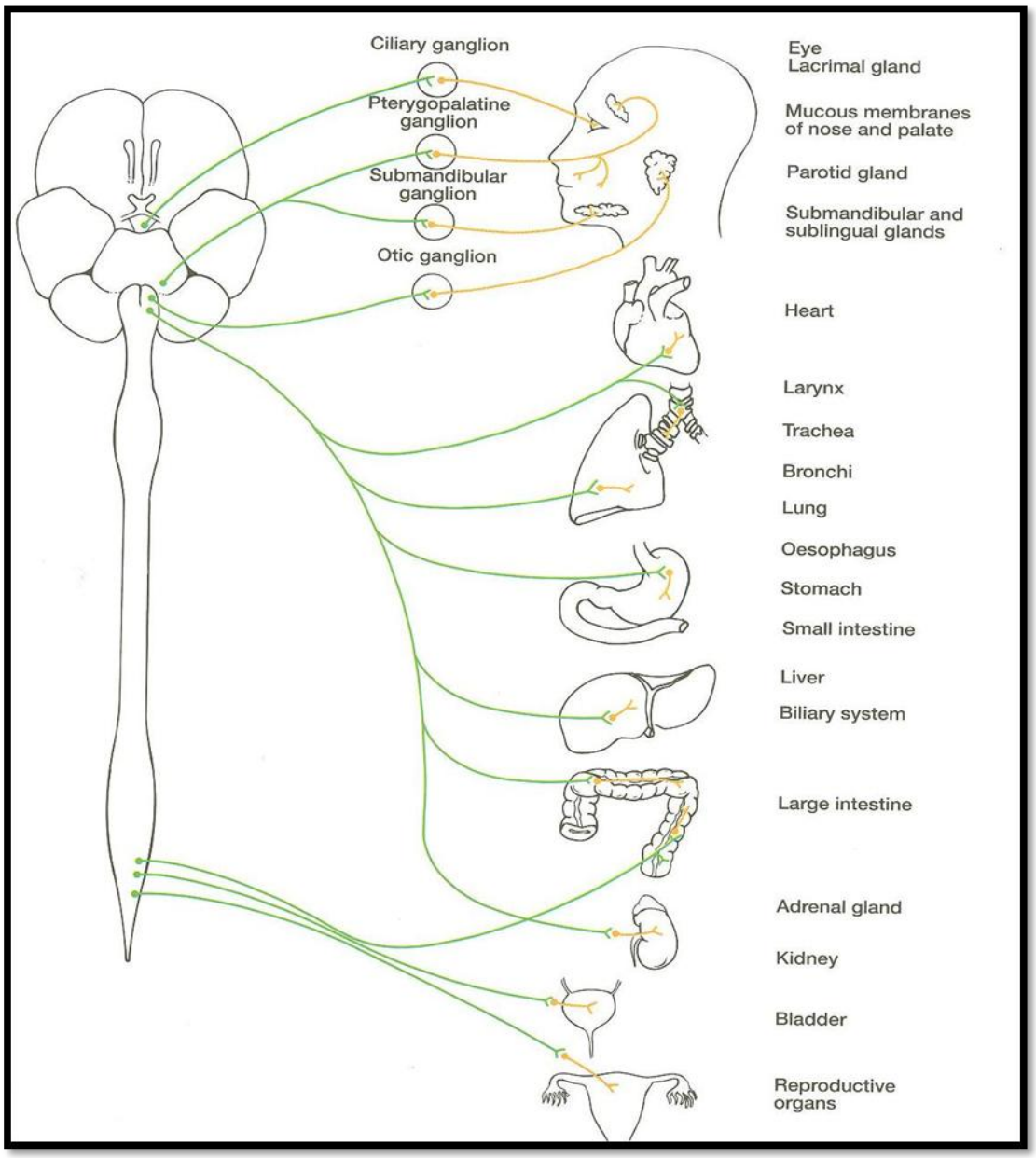
Distibaution of ANS:

- **Both divisions innervate mostly the same structure & operate in conjunction with one another (have antagonistic control over the viscera).**
- **Some viscera do not possess both divisions e.g. sweat glands, adrenal medulla, erector pili muscles and many blood vessels have only sympathetic innervations.**

SYMPATHETIC NERVOUS SYSTEM



PARASYMPATHETIC NERVOUS SYSTEM



Foundation Block

Anatomy

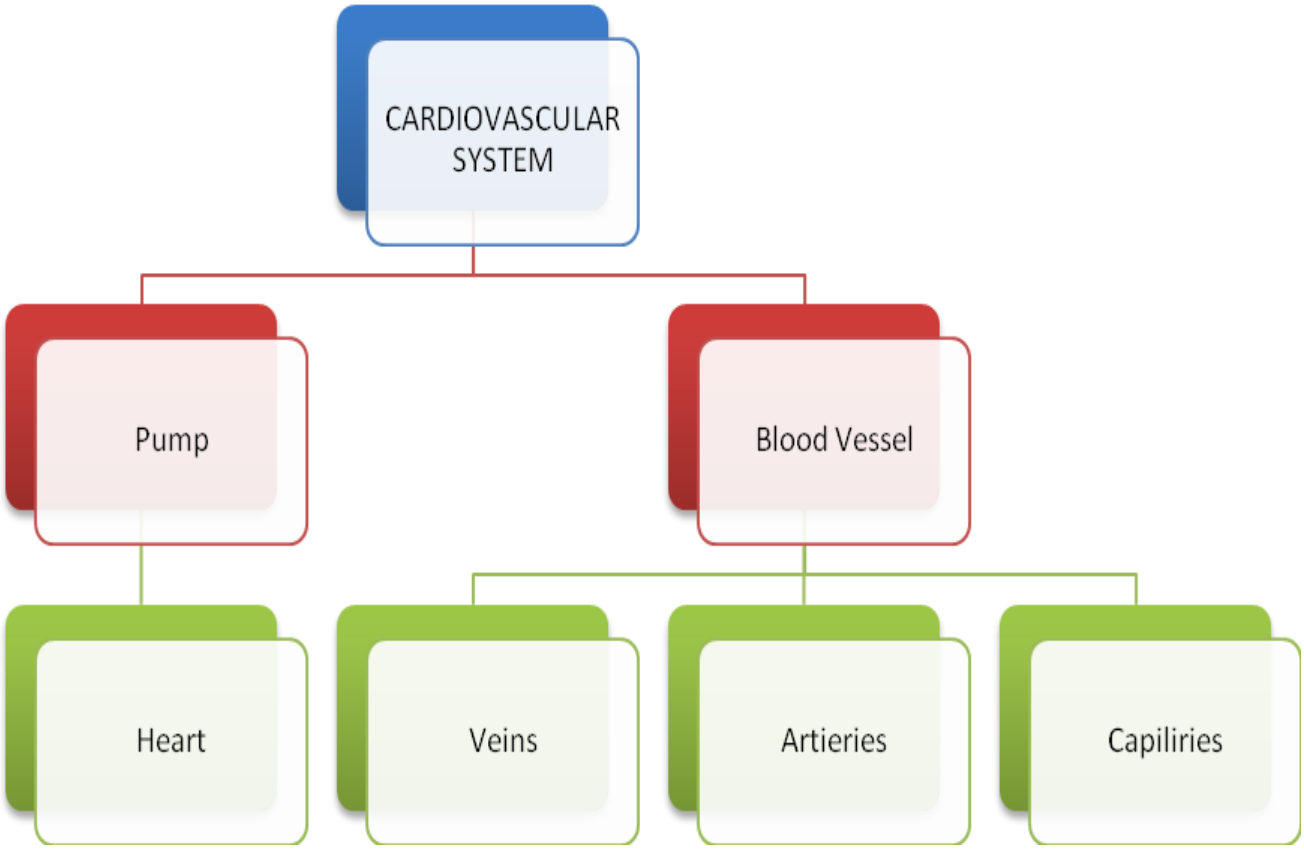
Cardiovascular System

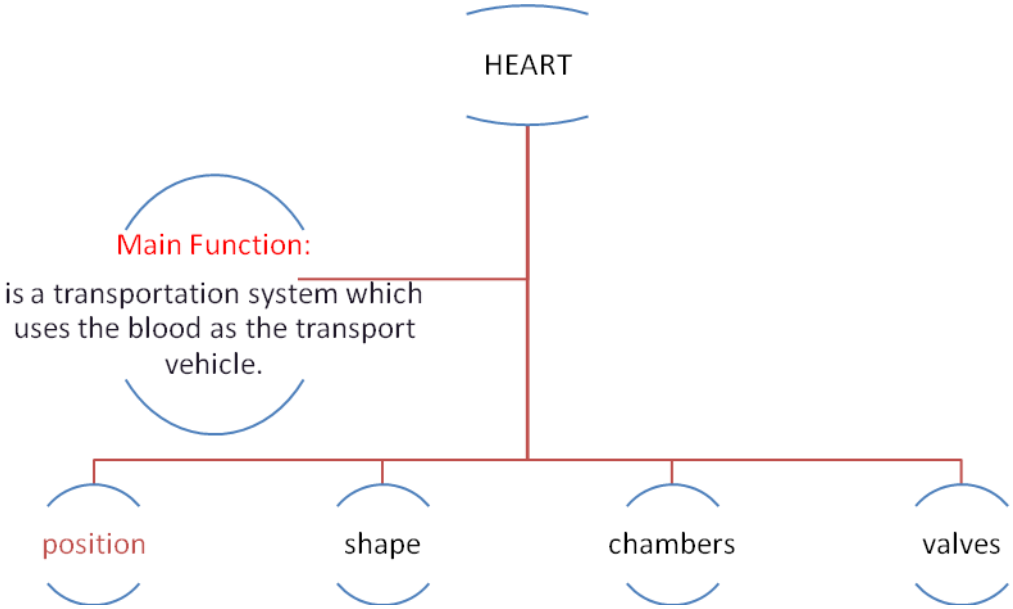
Lecture -6-

Objective:

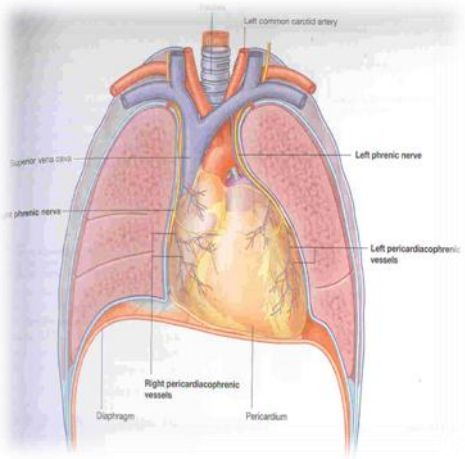
At the end of the lecture, students should be able to:

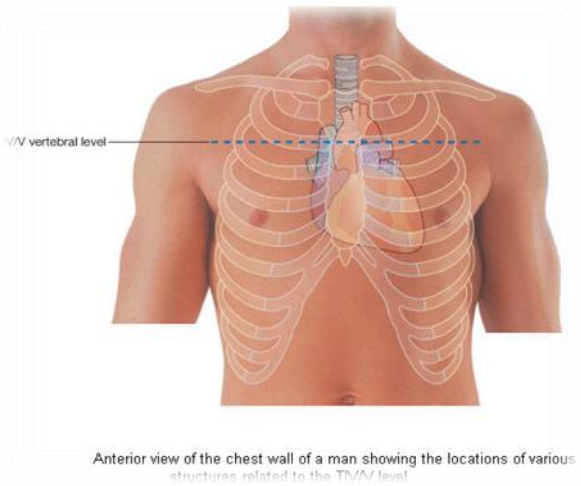
- ✓ Identify the components of the cardiovascular system.
- ✓ Describe the *Heart* as regards (position, chambers and valves).
- ✓ Describe the Blood vessels (Arteries, Veins and Capillaries).
- ✓ Describe the *Portal System.*
- ✓ Describe the *Sinusoids.*
- ✓ Describe the Functional and Anatomical end arteries.
- ✓ Describe the Arteriovenous Anastomosis.


CARDIOVASCULAR SYSTEM
Pump
Blood Vessel
Heart
Veins
Artieries
Capiliries

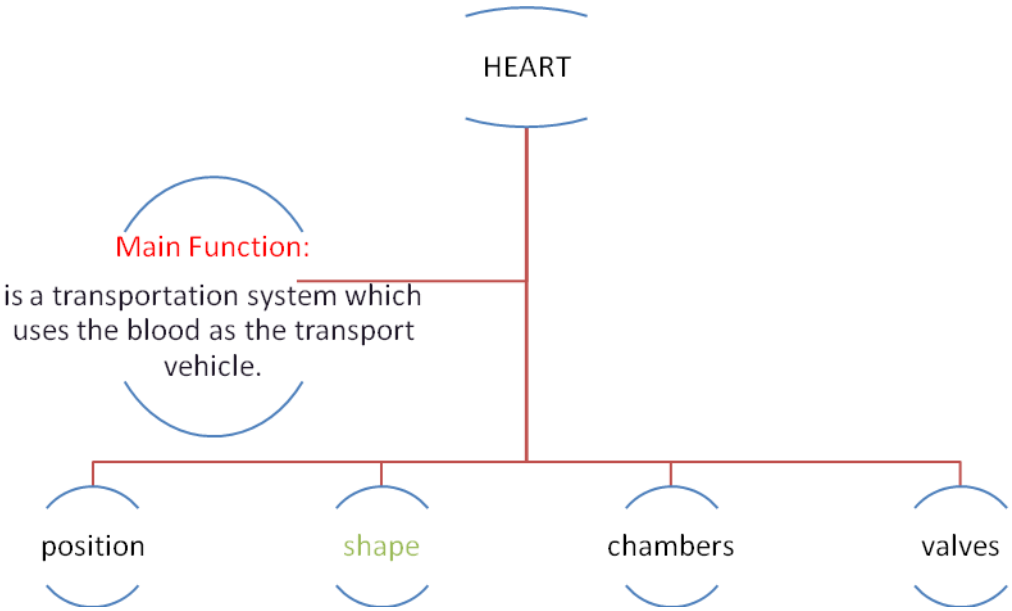


- in the thoracic cavity known as the ***Middle Mediastinum***between the two pleural sacs.
- Enclosed by a **<u>double</u>** sac of serous membrane (**Pericardium**).
- 2/3 of the heart lies to the left of median plane.





Anterior view of the chest wall of a man showing the locations of various structures related to the TIV/V level



It is a hollow, cone shaped muscular pump that keeps circulation going on.

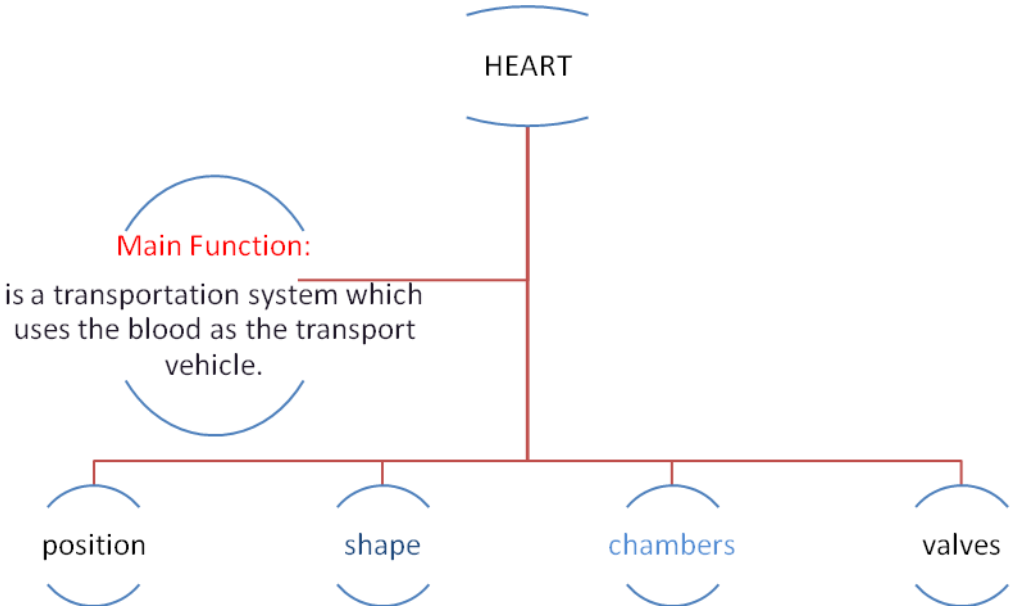
It is the size of hand's fist of the same person.
It has:

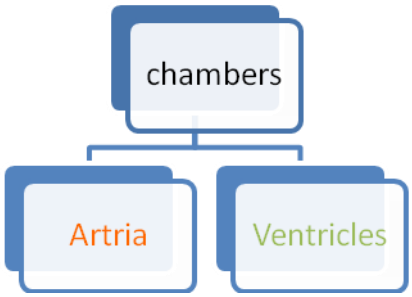
1. Apex
2. Base
3. Surfaces:

Diaphragmatic &Sternocostal.

4. Borders:

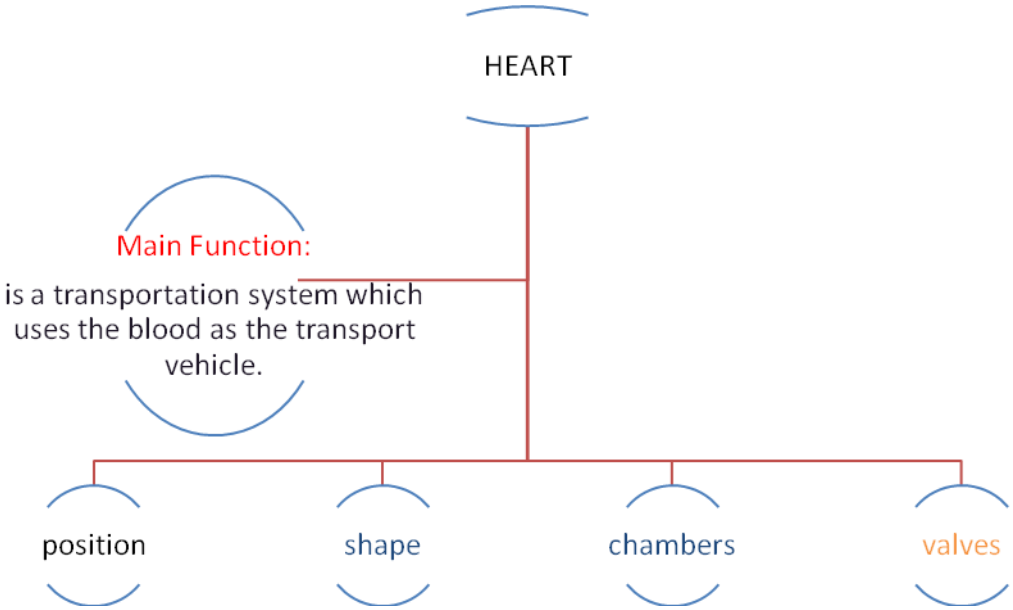
Right, Left, Inferior.





- They bare two (Right & Left).
- Superior in position.
- They are the receiving chambers.
- They have thin walls.
- The upper part of each atrium is the Auricle.
- *The Right Atrium* receives the venous blood coming to the heart.
- *Left Atrium* receives arterial blood coming from the lungs.

- The inferior chambers.
- They are two (right & left).
- They have thick walls.
- They are the discharging chambers (actual pumps).
- Their contraction propels blood out of the heart into the circulation.



Atrioventricular Valves:

between atria & ventricles.

allow the blood to flow in one direction from the atria to the ventricles.

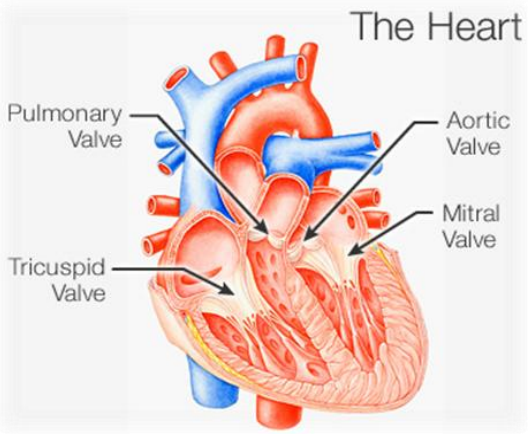
Right AVV (Tricuspid).

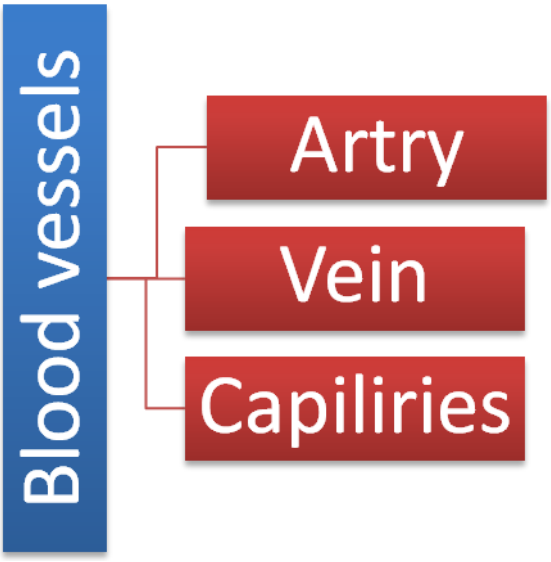
Left AVV (Bicuspid).

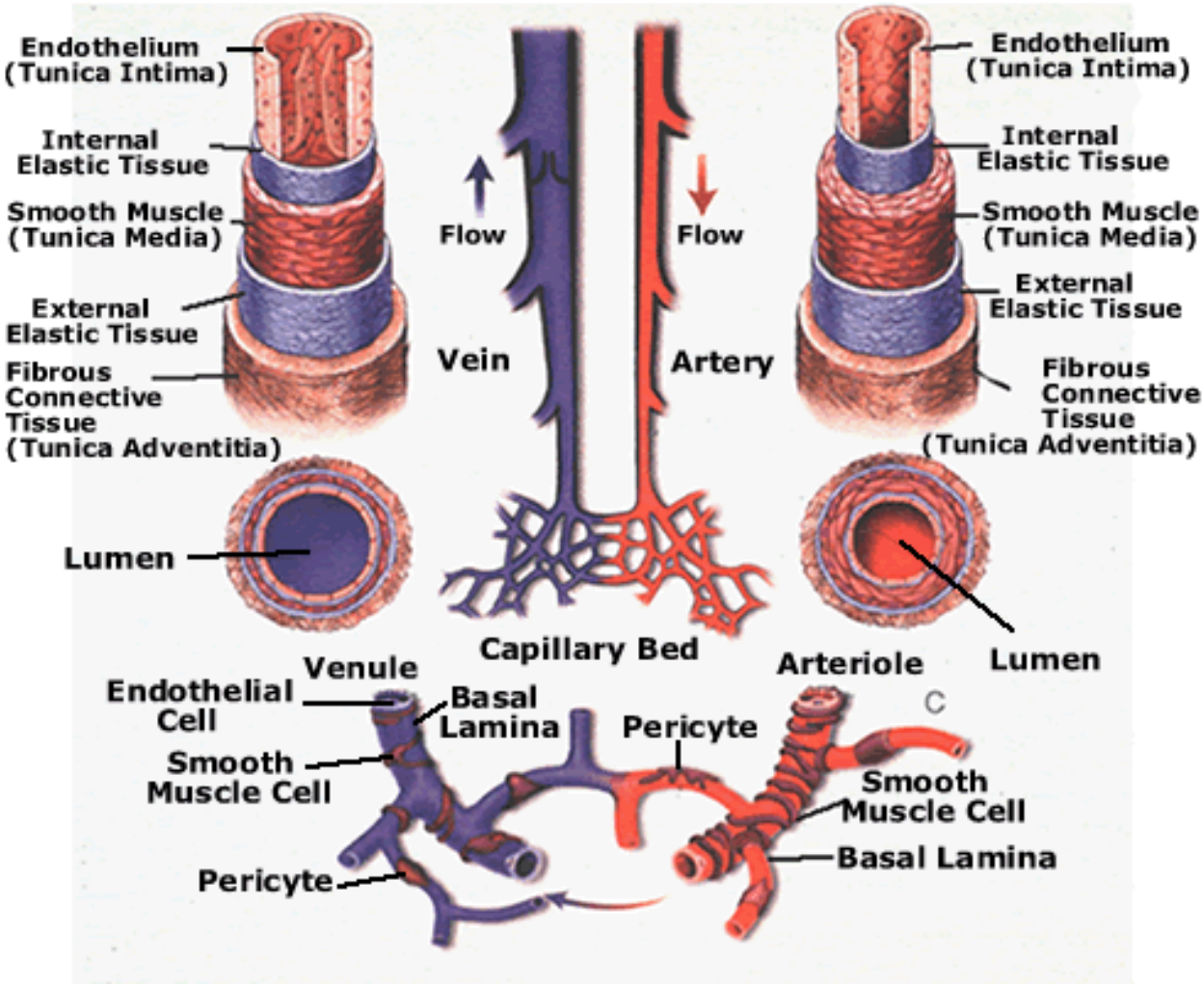
Semilunar Valves (Aortic & Pulmonary):

Between the right and left ventricles and the great arteries leaving the heart.

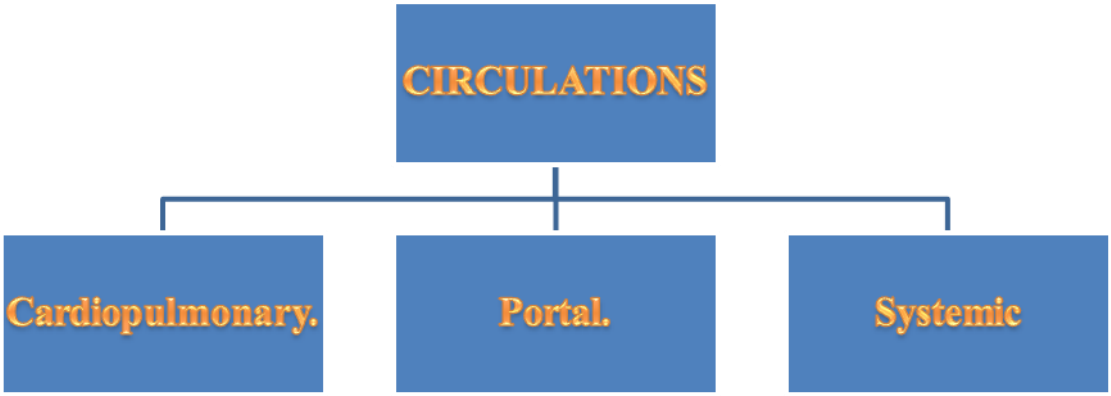
allow the flow of blood from the ventricles to these arteries.

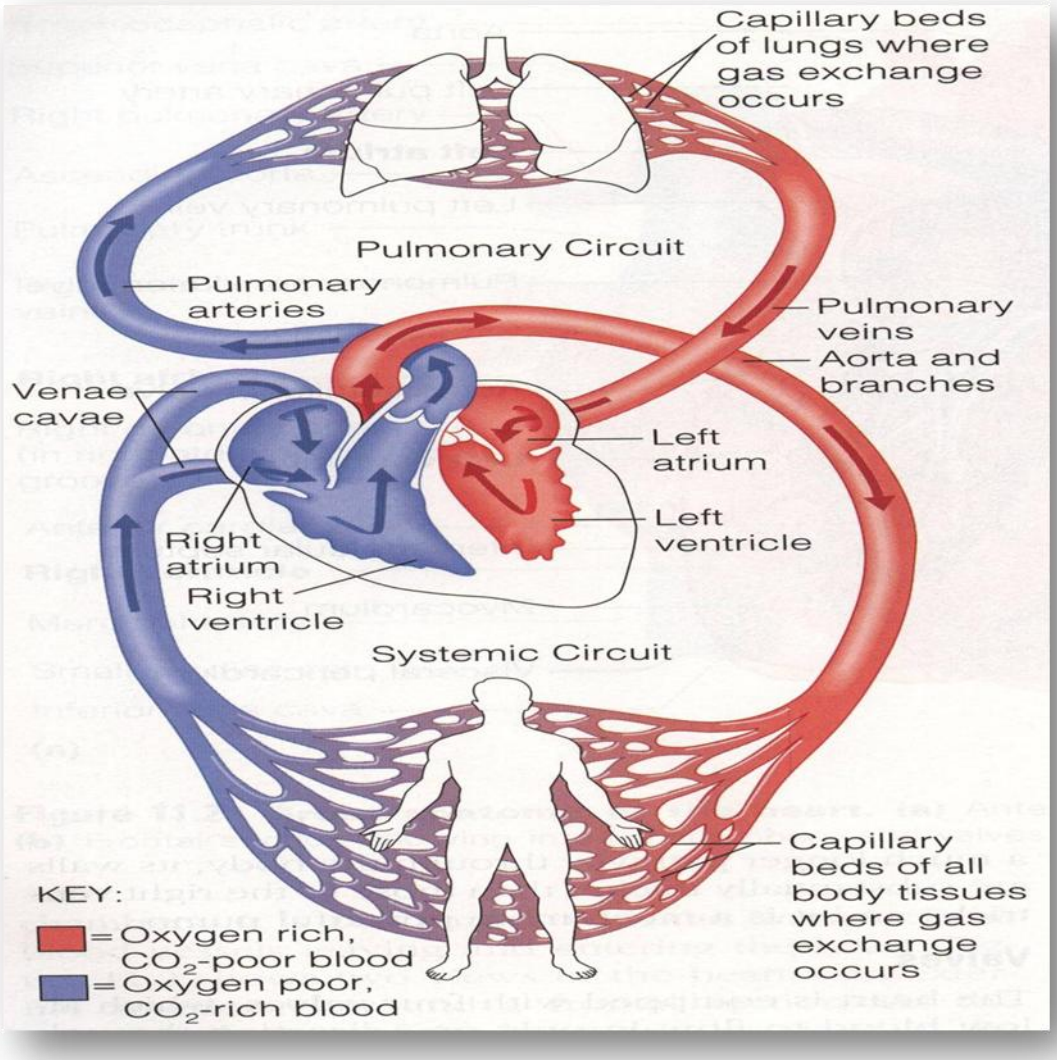



Blood vessels
Artry
Vein
Capiliries


Endothelium (Tunica Intima)
Internal Elastic Tissue
Smooth Muscle (Tunica Media)
External Elastic Tissue
Fibrous Connective Tissue (Tunica Adventitia)
Lumen
Flow
Flow
Vein
Artery
Capillary Bed
Endothelium (Tunica Intima)
Internal Elastic Tissue
Smooth Muscle (Tunica Media)
External Elastic Tissue
Fibrous Connective Tissue (Tunica Adventitia)
Lumen
Venule
Endothelial Cell
Basal Lamina
Smooth Muscle Cell
Pericyte
Pericyte
Arteriole
Smooth Muscle Cell
Basal Lamina

	Arteries	veins
The wall	**Thick**	**Thin**
Valves	**Not exist**	**exist**
Smallest Arteries and veins	**arterioles**	**venules**
Pump	**Active**	**passive**
Special situation	**End arteries**	**Deep veins**


CIRCULATIONS
Cardiopulmonary.
Portal.
Systemic


Capillary beds of lungs where gas exchange occurs
Pulmonary Circuit
Pulmonary arteries
Pulmonary veins
Aorta and branches
Venae cavae
Left atrium
Left ventricle
Right atrium
Right ventricle
Systemic Circuit
Capillary beds of all body tissues where gas exchange occurs
KEY:
= Oxygen rich, CO_2-poor blood
= Oxygen poor, CO_2-rich blood

SUMMARY

- *The cardiovascular system is a transporting system.*
- *It is composed of the heart and blood vessels.*
- *The heart is cone shaped, covered by pericardium and composed of four chambers.*
- *The blood vessels are the arteries, veins and capillaries.*
- *Arteries transport the blood from the heart.*
- *The terminal branches of the arteries can anastomose with each other freely or be anatomic or functional end arteries.*
- *Veins transport blood back to the heart.*
- *Capillaries connect the arteries to the veins.*
- *Sinusoids are special type of capillaries.*
- *The portal system is composed of two sets of capillaries.*
- *The veins from the GIT go first to the liver through the portal vein.*

The Notes

STERNOCOSTAL = COVERED BY STERNUM AND RIBS

DIAPHRAGMATIC = LINED BY DIAPHRAGM

ATRIUM: RECEIVING THE DEOXYGENATED BLOOD

VENTRICLE: DISCHARGING BLOOD "DEOXYGENATED OR OXYGENATED"

ARTERY IS RICH IN O2 "فيسبب ضغط ويحتاج جدار سميك"

DYSFUNCTION IN VALVES LEADS TO VARICOSE VEIN "الدوالي وهي عبارة عن تجمع للدم الغير قادر على الصعود للقلب بعكس الجاذبية"

*VESSEL ENTERS THE HEART IS VEIN

*VESSEL DISCHARGES FROM THE HEART IS ARTERY

Arterial blood is Oxygenated EXCEPT Pulmonary artery which carries DEOXYGENATED blood to the lungs and this artery has no branches and has thin wall

VALVES "عبارة عن شرفات إذا حاول الدم العودة تقترب من بعضها لتغلق ولاتسمح له بالعودة "

AVV=ATRIOVENTICULAR

ANASTOMOSE E.G. SCAPULA "متحركة وتحتاج أكثر من شريان للتعويض في حال قطع أحدها"