

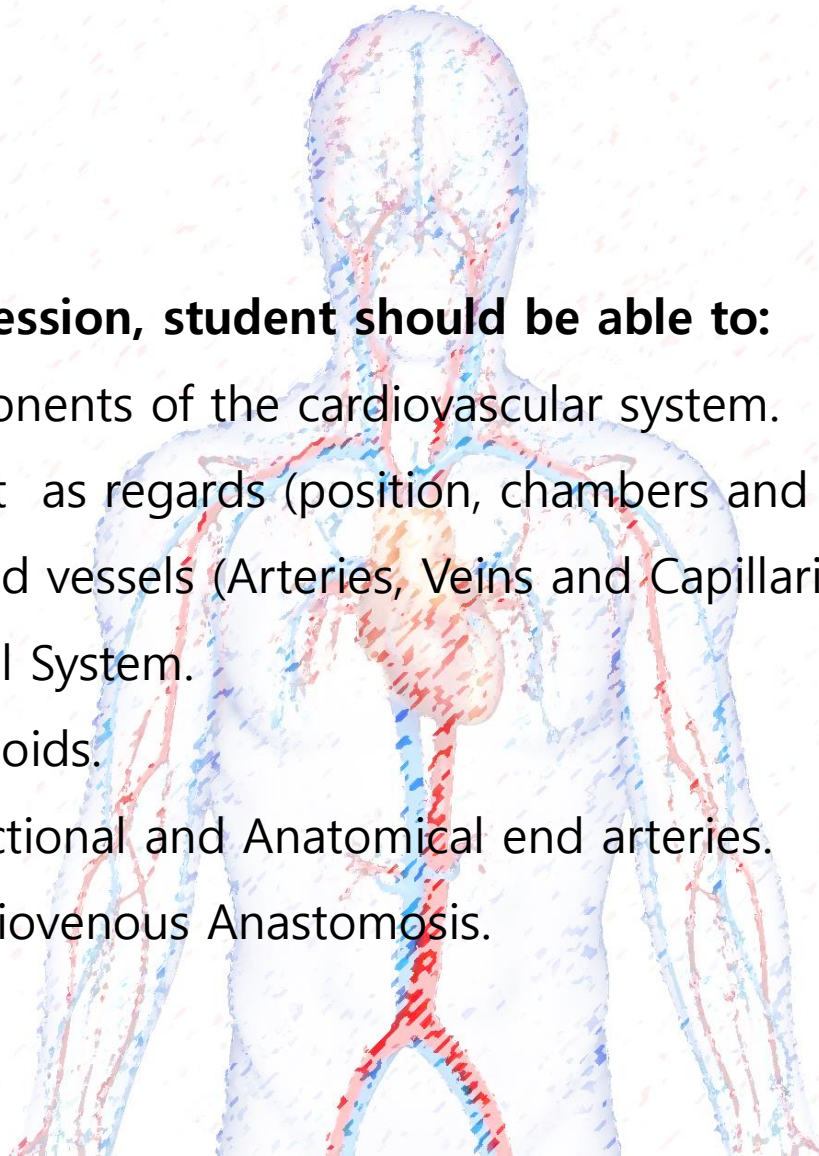
Introduction of Cardiovascular System

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Objectives

By the end of this session, student should be able to:

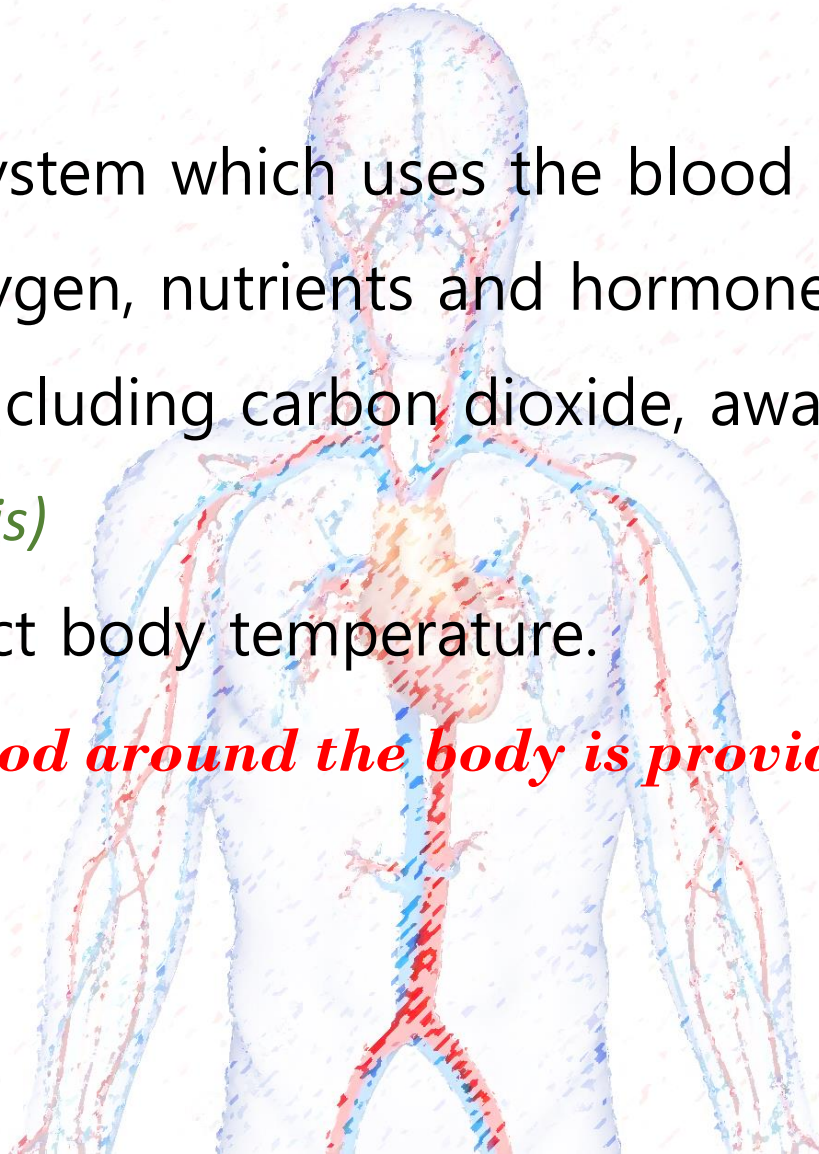
- ❖ Identify the components of the cardiovascular system.
- ❖ Describe the Heart as regards (position, chambers and valves).
- ❖ Describe the Blood vessels (Arteries, Veins and Capillaries).
- ❖ Describe the Portal System.
- ❖ Describe the Sinusoids.
- ❖ Describe the Functional and Anatomical end arteries.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



Functions of the CVS

- It is a transportation system which uses the blood as the transport vehicle.
- **Transports** - water, oxygen, nutrients and hormones to cells.
- **Transports** - wastes, including carbon dioxide, away from the cells.
- *(vital for body homeostasis)*
- Helps - maintain correct body temperature.

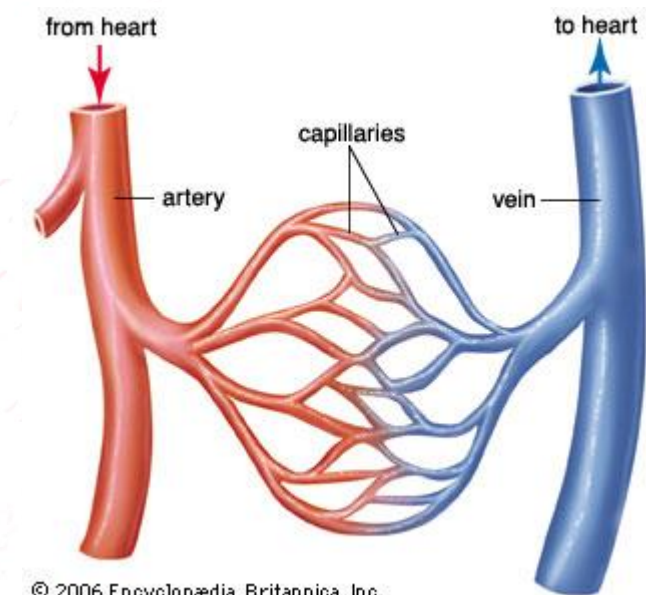
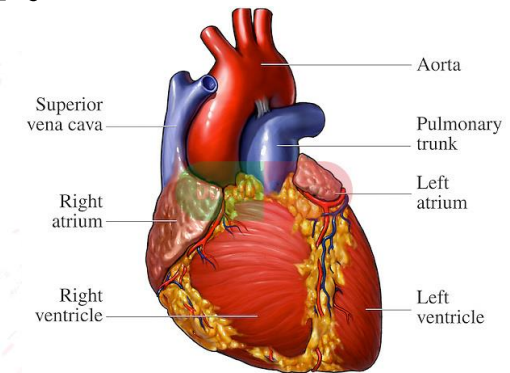
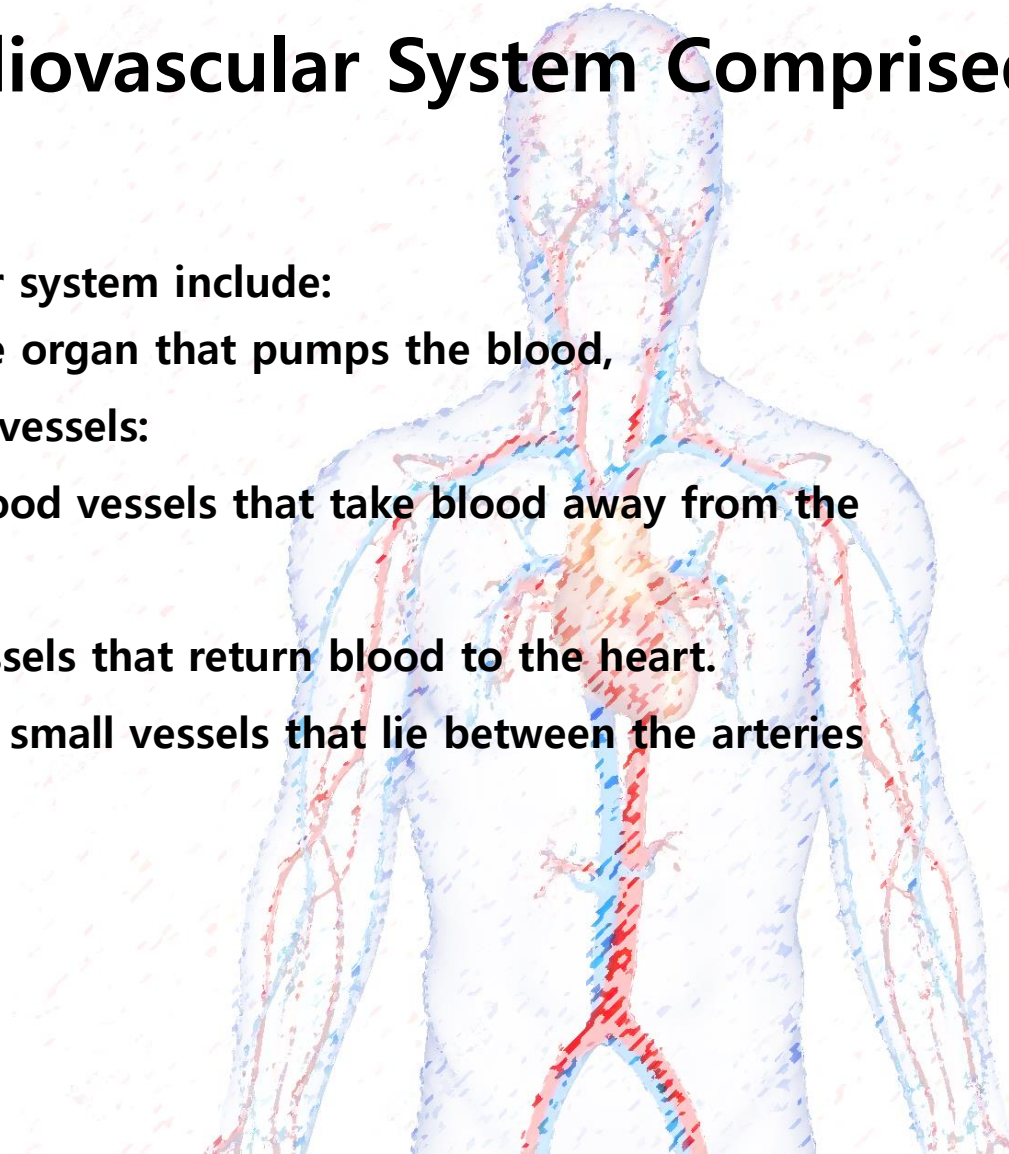
The force to move the blood around the body is provided by the beating Heart.



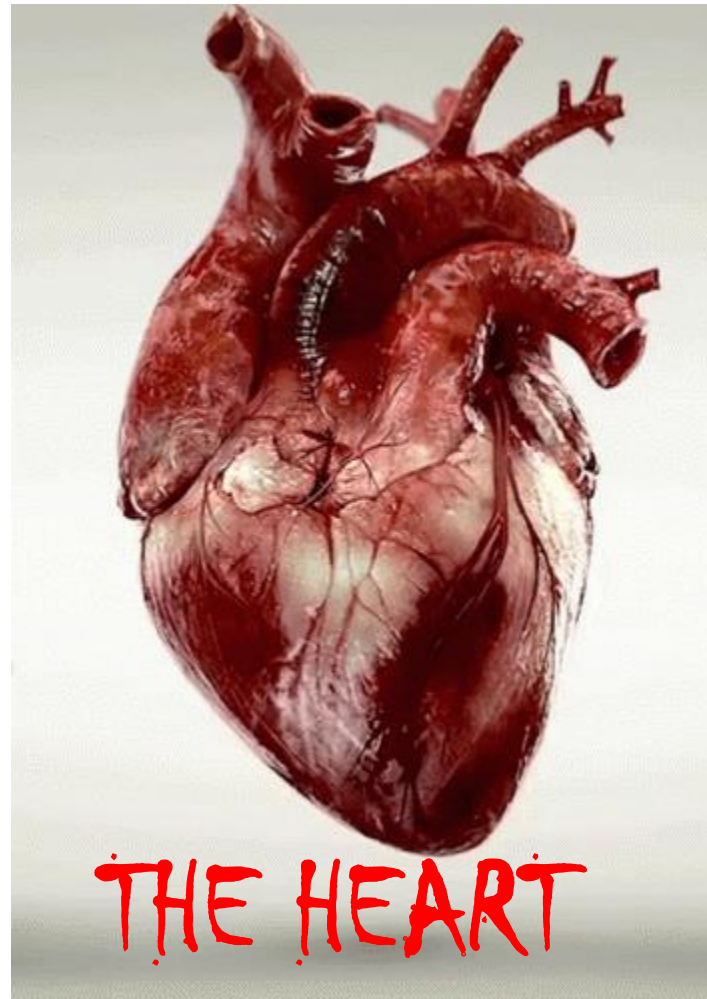
What Is The Cardiovascular System Comprised of?

The parts of the cardiovascular system include:

- The **heart**, which is the organ that pumps the blood,
- & a network of blood vessels:
 - i. **Arteries:** The blood vessels that take blood away from the heart.
 - ii. **Veins:** Blood vessels that return blood to the heart.
 - iii. **Capillaries:** Very small vessels that lie between the arteries and veins.



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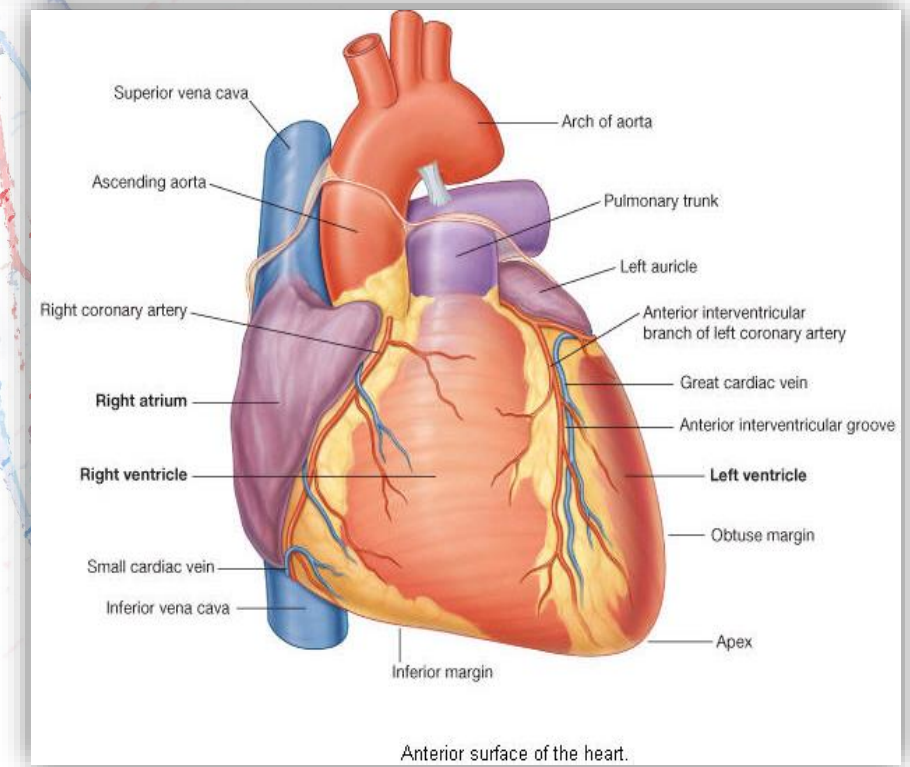
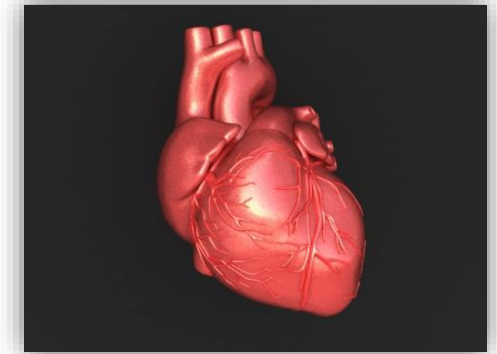
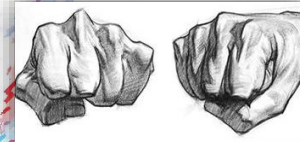
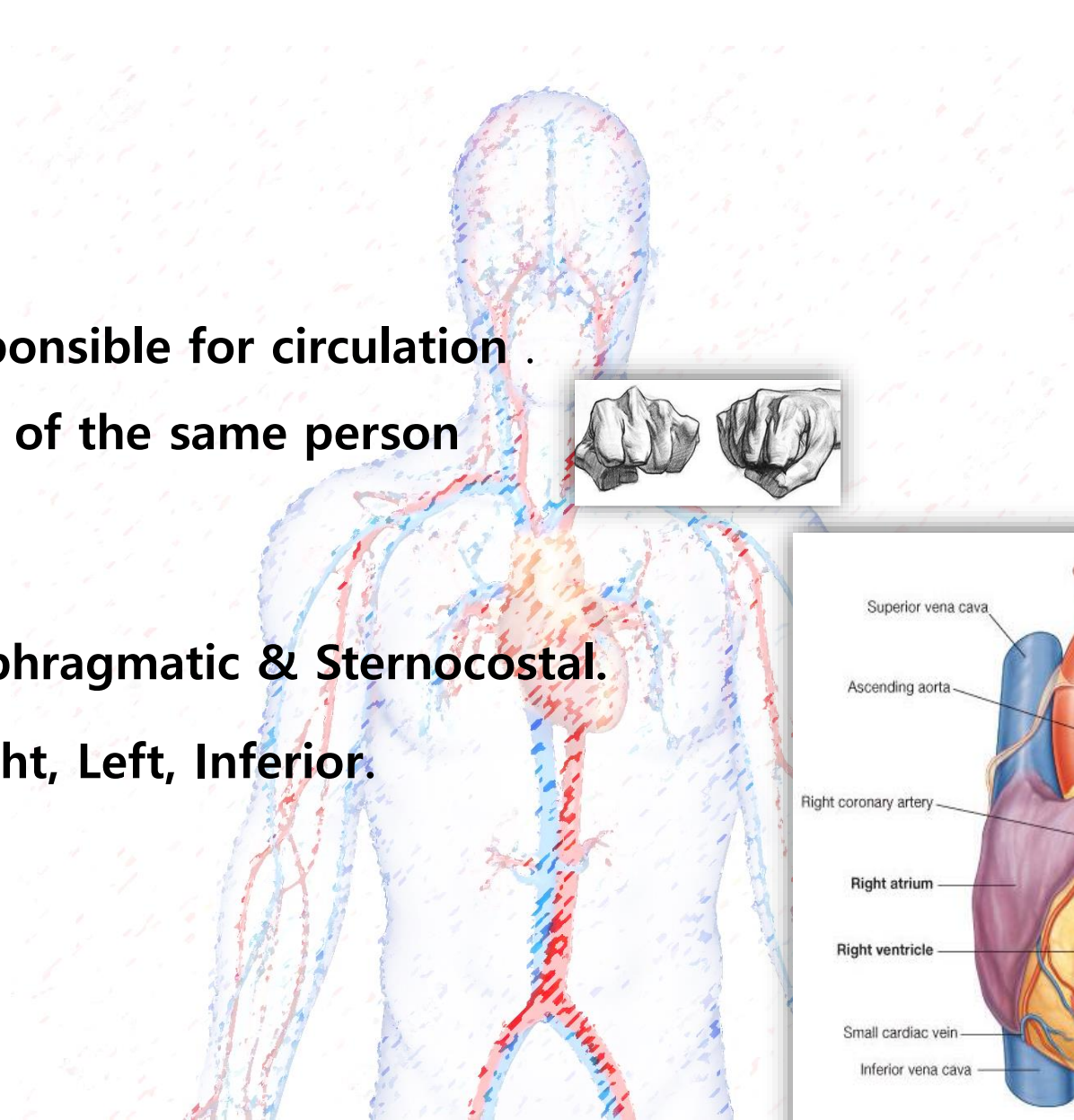
THE HEART

Is a muscular pump responsible for circulation .

Is usually the size of fist of the same person

Has:

- Apex & Base.
- Two Surfaces: Diaphragmatic & Sternocostal.
- Three borders: Right, Left, Inferior.



THE HEART

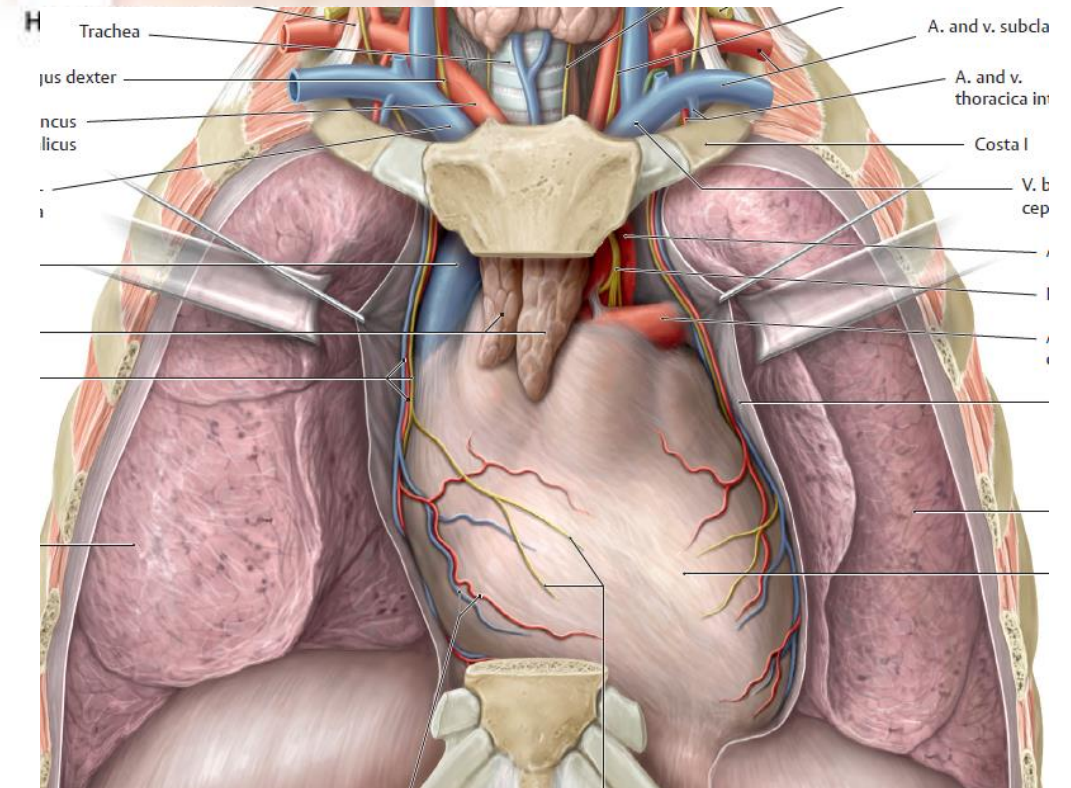
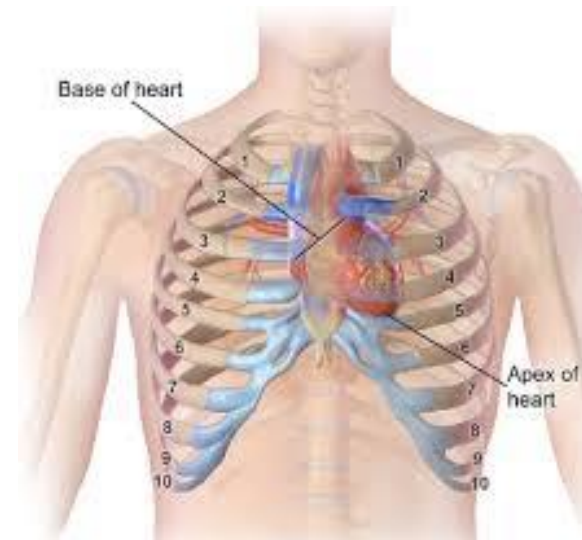
POSITION/LOCATION

Lies obliquely in the thorax between the two pleural sacs.

"More specifically within a centrally located partition known as the Middle Mediastinum"

MEDIA-STI-NUM

- 2/3 of the heart lies to the left of median plane.
- Enclosed by a double sac of serous membrane (Pericardium).

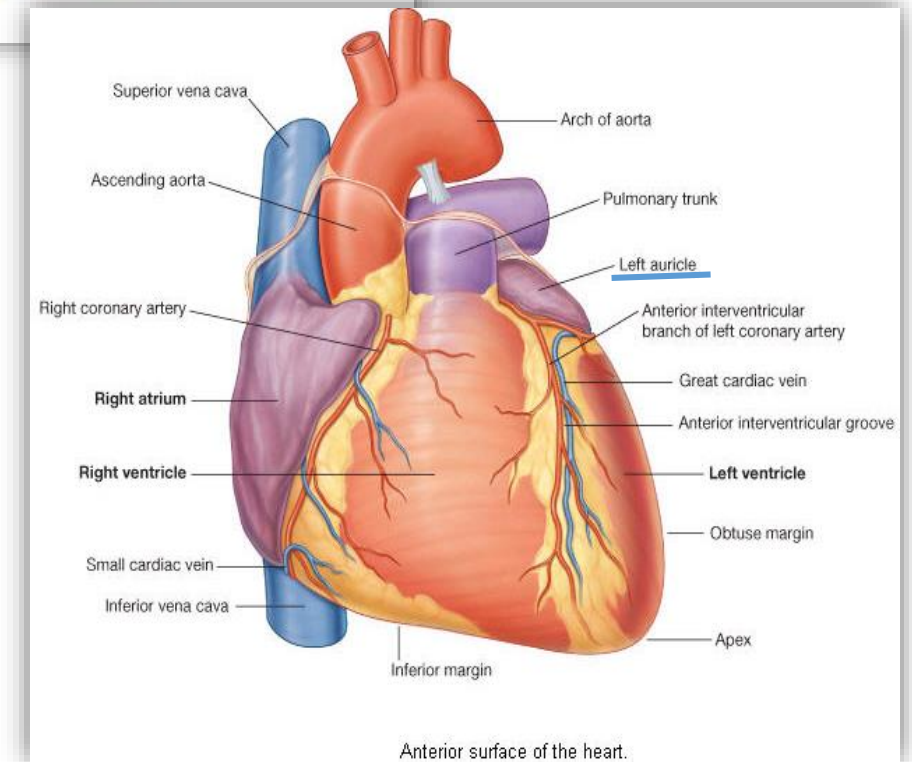
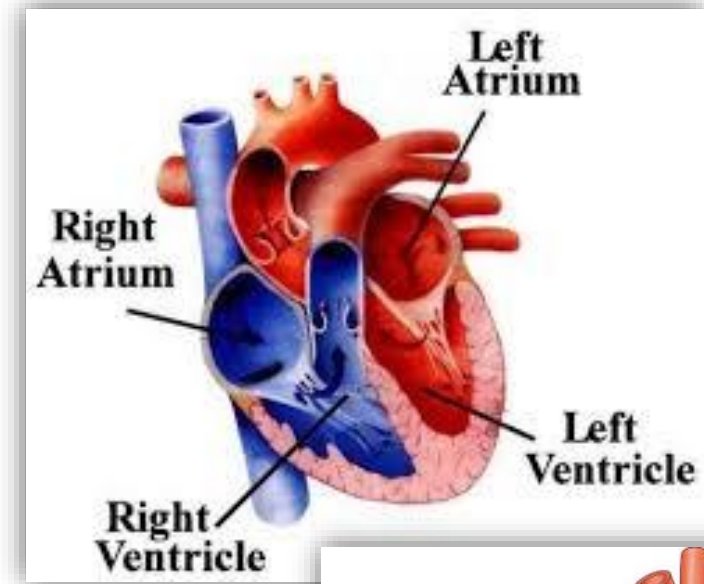


THE HEART CHAMBERS

4 CHAMBERS , Two Atria (Right & Left)
and
Two Ventricles (Right & Left)

ATRIA:

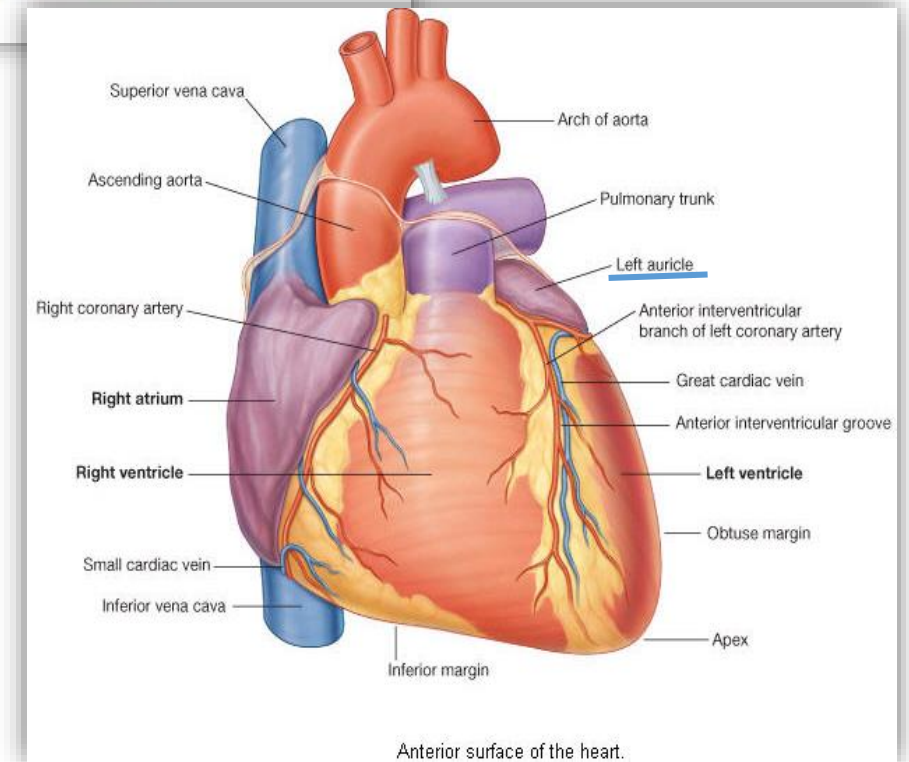
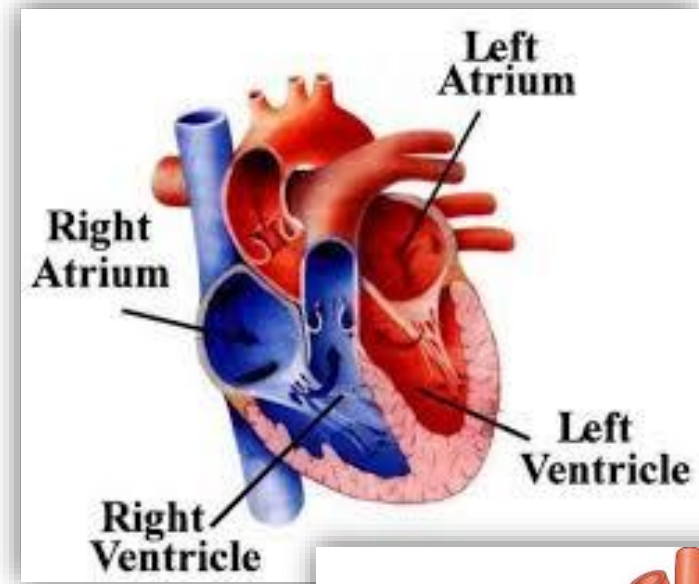
- Are Superior in position.
- Are the receiving chambers.
- have thin walls.
- The upper part of each atrium is the **Auricle**.
- **Left Atrium** receives arterial blood coming from the lungs.
- The **Right Atrium** is the first chamber that receives the venous blood entering to the heart.



THE HEART-CHAMBERS

VENTRICLES:

- Are inferior chambers.
- have thick walls.
- Are discharging chambers (Actual Pump).
- Their contraction propels blood out of the heart into the circulation.
- **The left ventricle forms the APEX of the heart.**



THE HEART- VALVES

4 VALVES

Two Atrioventricular (between Atria & Ventricles)

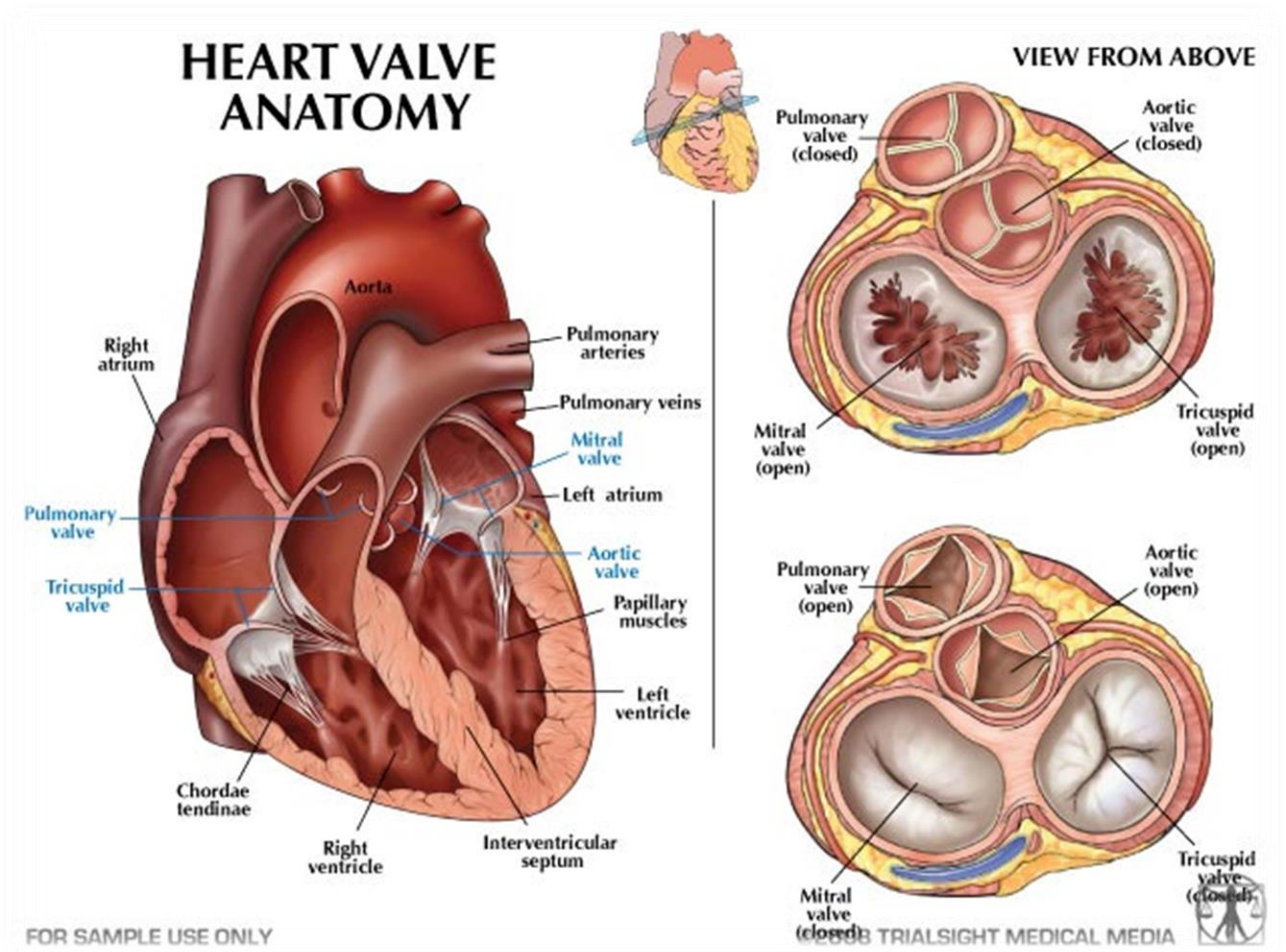
Right AVV : Tricuspid

Left AVV : Bicuspid (*Mitral*)

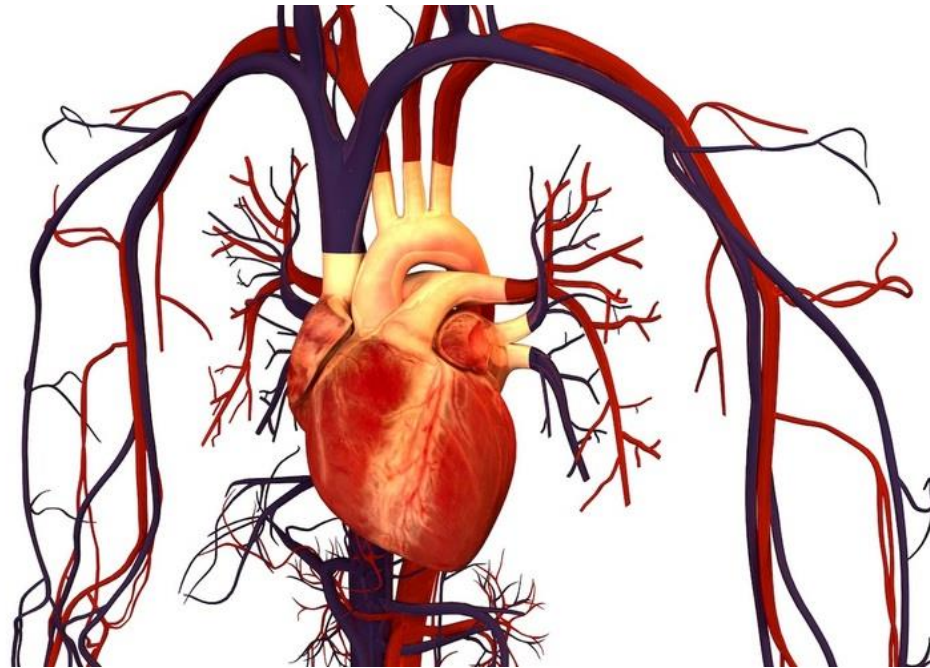
- Allow the blood to flow in one direction i.e. from the atria to the ventricles.

Two Semilunar (aortic & Pulmonary)

- Found between the **right and left ventricles** and the great arteries leaving the heart (**Aorta & Pulmonary trunk** respectively).
- They allow the flow of blood from the ventricles to these arteries.



THE BLOOD VESSELS



BLOOD VESSELS

ARTERIES

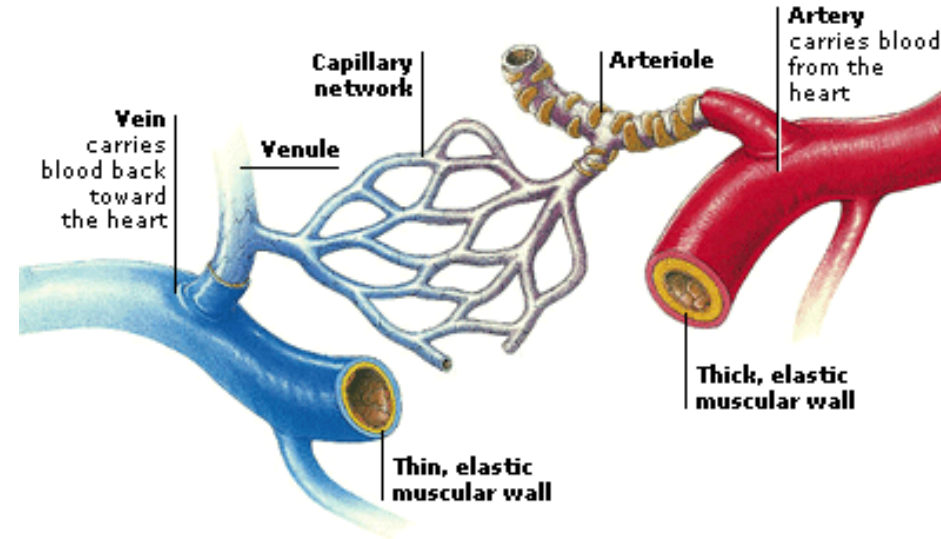
- Thick walled, **DO NOT** have valves.
- The smallest arteries are **arterioles**.

VEINS

- Thin walled.
- Many of them possess valves.
- The smallest veins are **venules**

CAPILLARIES

- The smallest blood vessels (microscopic).
- Form a network between the arterioles and venules.
- Site of exchange between tissue and blood
- Wall only consist of endothelium
- e.g. Tissue with no capillaries; Cornea of eye and Hyaline cartilage

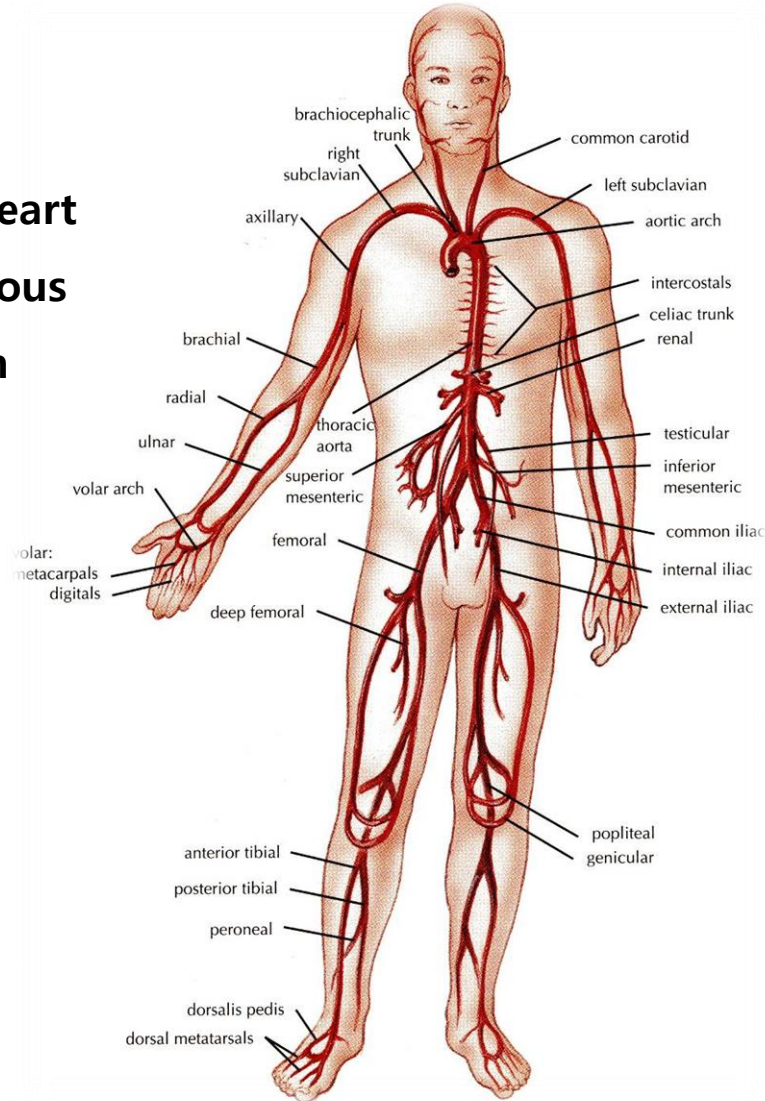


Sinusoids

- wide capillaries with discontinuous endothelium
- Numerous in LIVER, SPLEEN & BONE MARROW, Pituitary gland

ARTERIES

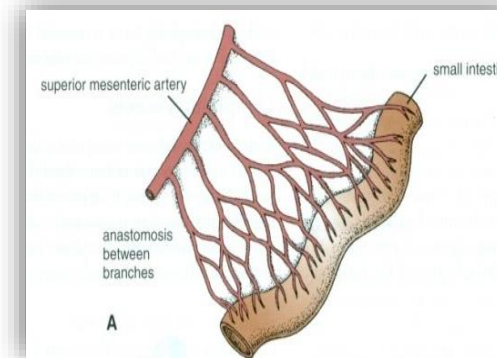
- transport blood from the heart and distribute it to the various tissues of the body through their branches



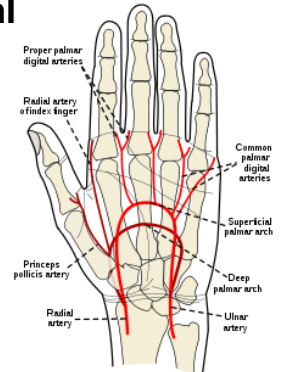
ARTERIAL ANASTOMOSES

is a connection between two arteries, i.e. arteries meet **END TO END** (arterio-arterial anastomosis)

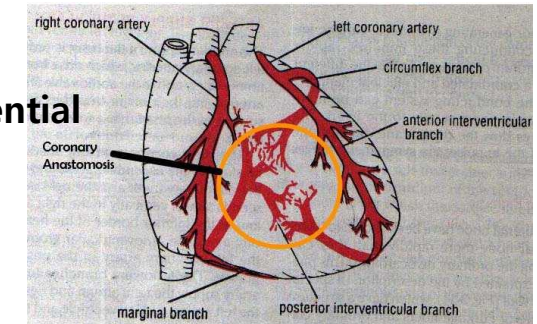
- Actual
- Potential



Actual



Potential



END ARTERIES

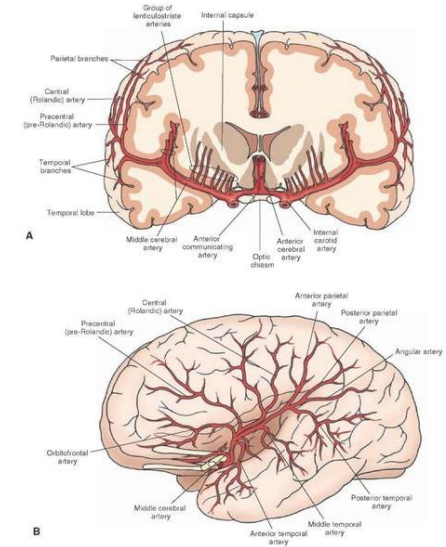
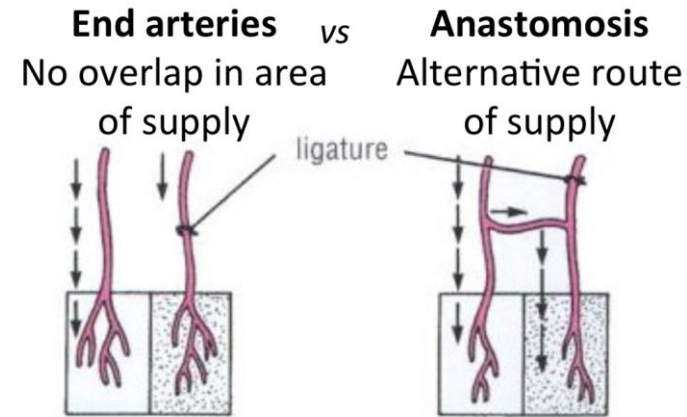
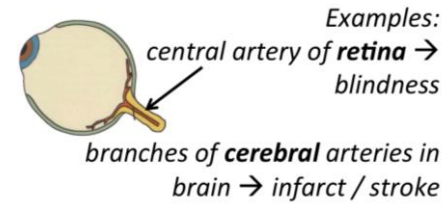
No precapillary anastomosis between adjacent arteries, interruption of arterial blood flow- **INFARCTION / GANGRENE**
 e.g. liver, spleen, kidney, retina

Anatomic End arteries:

- Vessels whose terminal branches **do not anastomose** with branches of arteries supplying adjacent areas (Central artery of Retina).

Functional End arteries:

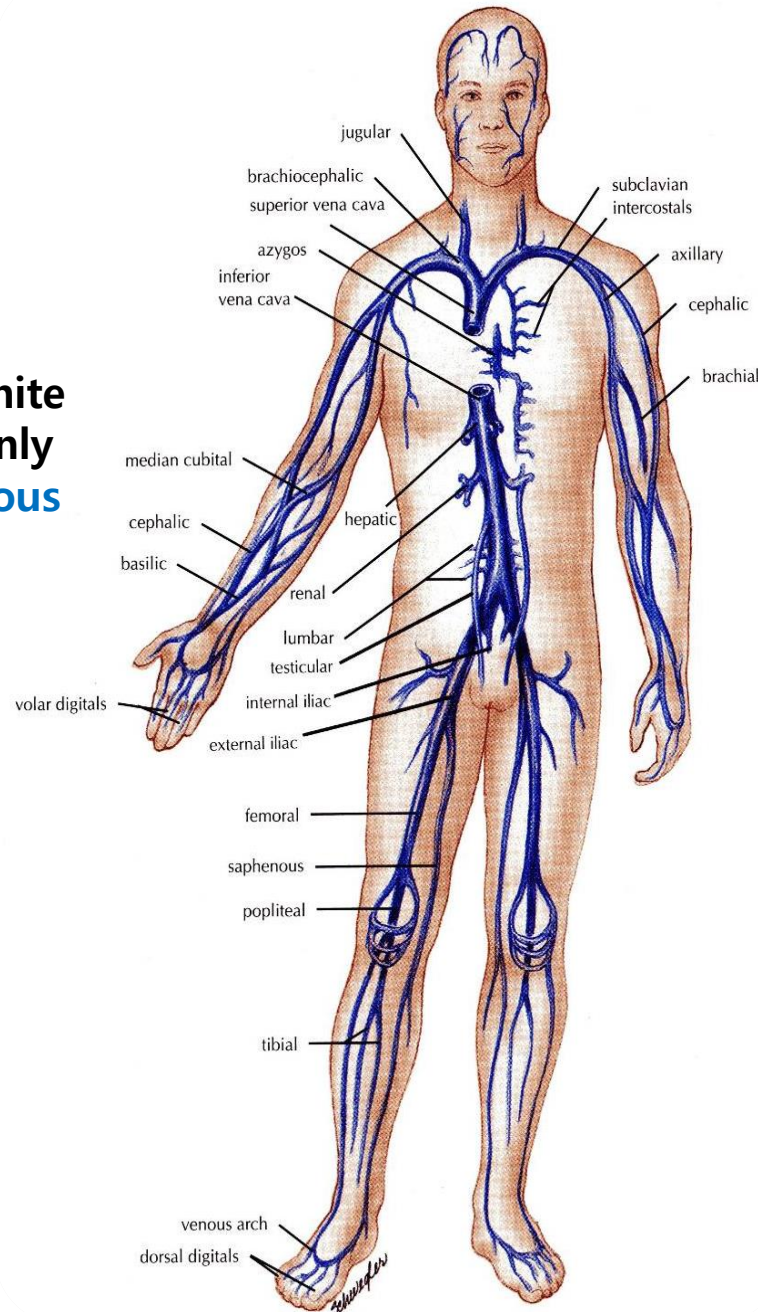
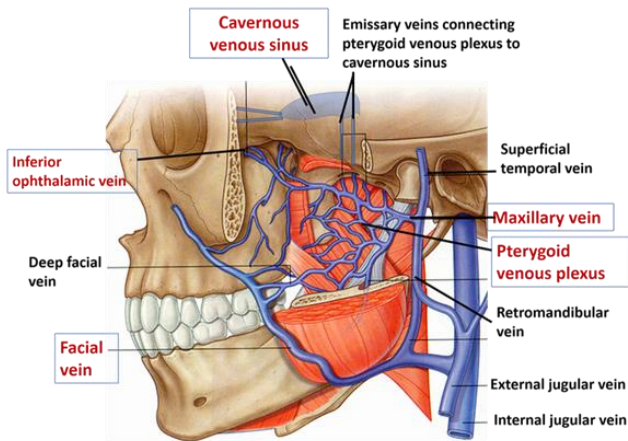
- The terminal branches **do anastomose** with those of adjacent arteries but the anastomosis is insufficient to keep the tissue alive if one of the arteries is occluded.



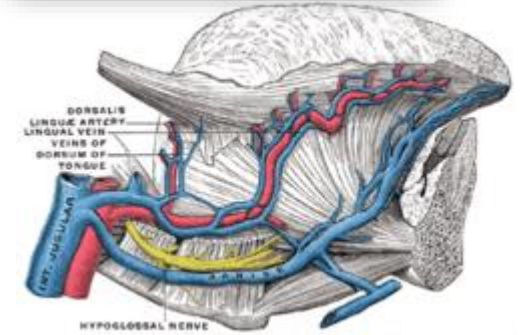
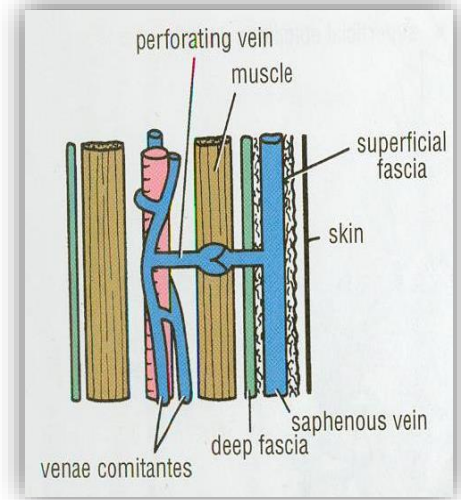
Functional End arteries

VEINS

- They transport blood back to the heart.
- The smaller venules (**Tributaries**) unite to form larger veins which commonly join with one another to form **Venous Plexuses**.



VENAE COMITANTES
 Deep veins accompanying the arteries, usually two.

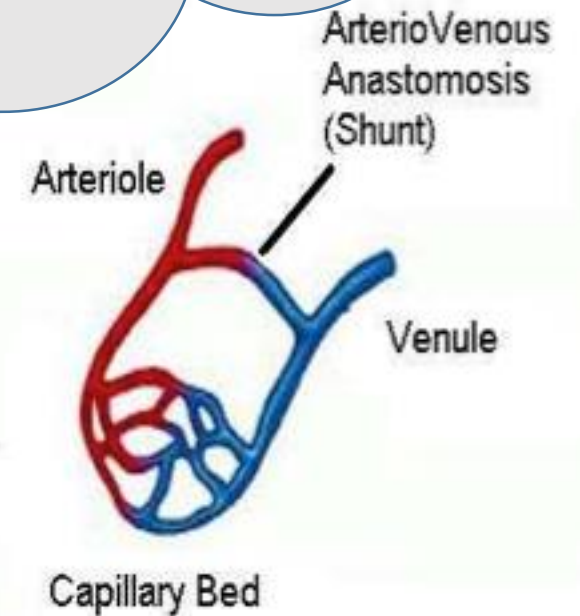
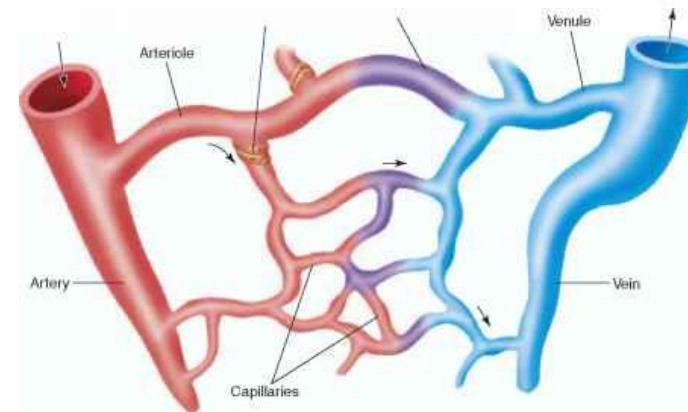


A circulatory **anastomosis** is a connection between two blood vessels.

1. **Arterio-arterial anastomosis**
2. **Veno-venous anastomosis**
3. **Arterio-venous anastomosis.**

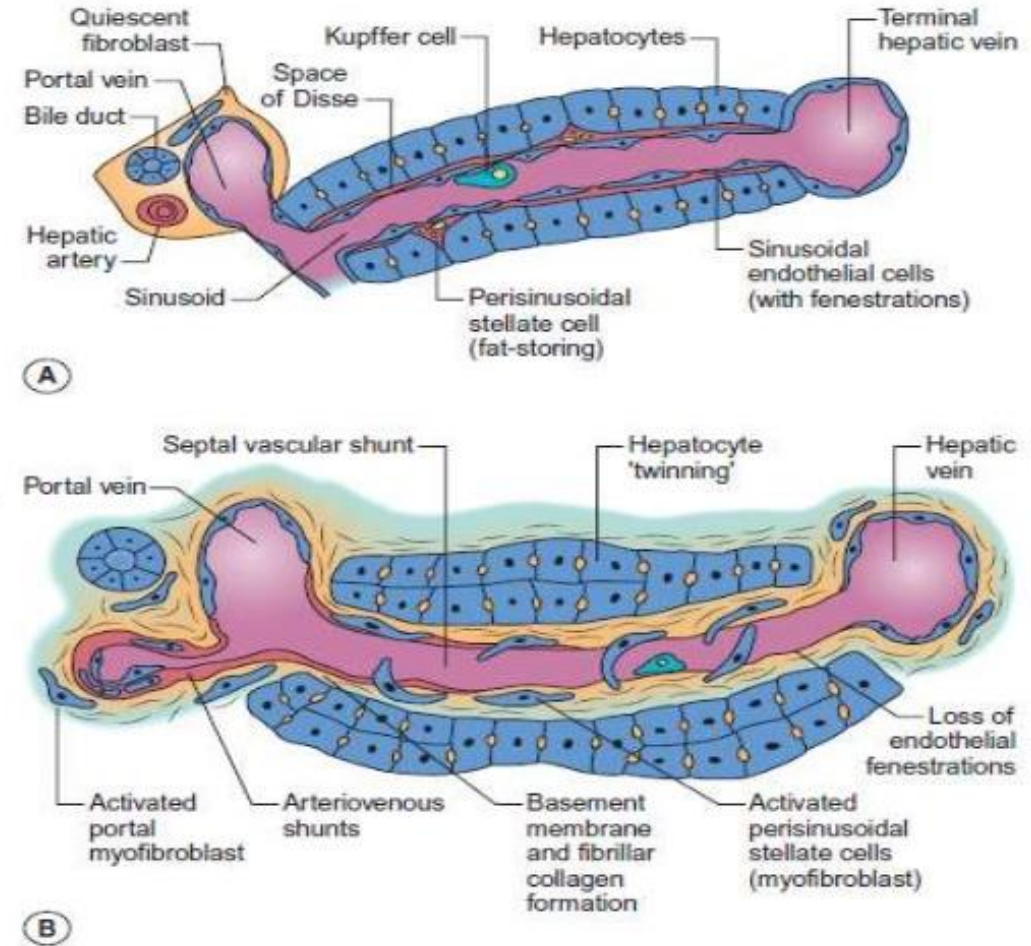
ARTERIOVENOS ANASTOMOSIS

- **Direct connections between the arteries and veins without the intervention of capillaries.**
- **EXAMPLE: Tips of the Fingers and Toes.**
- **May have a role in temperature regulation**



Sinusoids

- Wide capillaries with discontinuous endothelium
- Numerous in LIVER, SPLEEN & BONE MARROW, PITUITARY GLAND

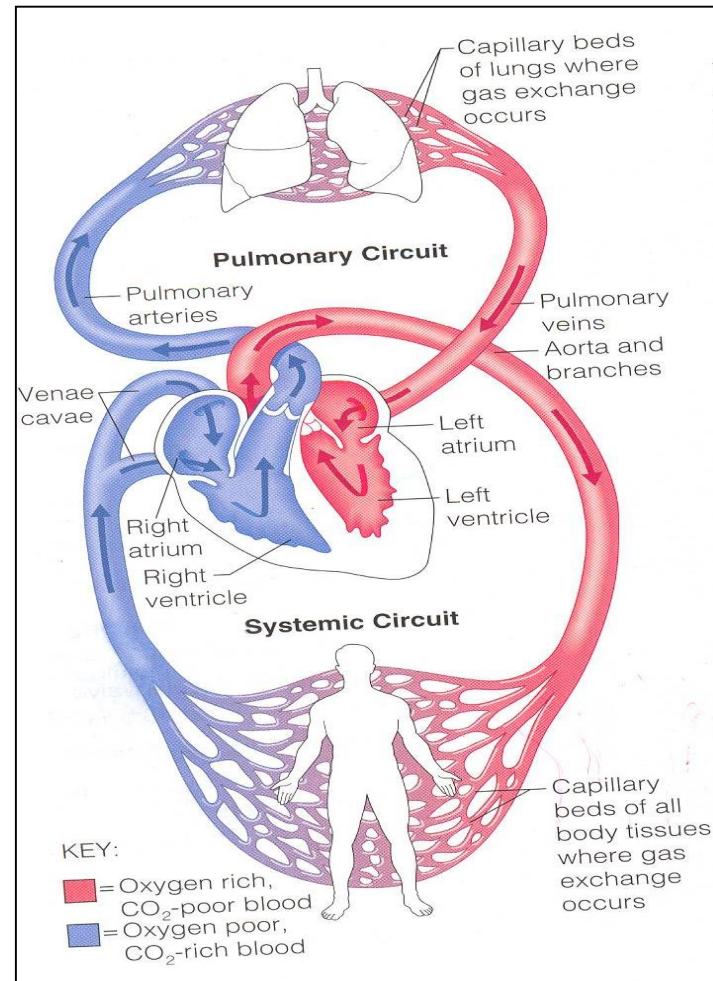


BLOOD CIRCULATION

- Cardiopulmonary Circulation
- Systemic Circulation

CARDIOPULMONARY:

- Takes place between the heart and lungs.
- The Right side of the heart (Right atrium & ventricle) receive oxygen poor blood
- This blood is pumped from the heart through the Pulmonary Trunk to the lungs.
- Gas exchange takes place in the lungs.
- It returned to the left side of the heart (left atrium & ventricle) through 4 Pulmonary Veins



SYSTEMIC:

Takes place between the heart and each cell of the body.

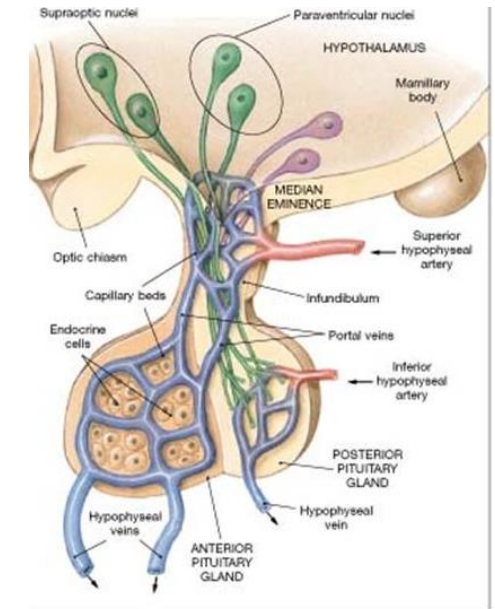
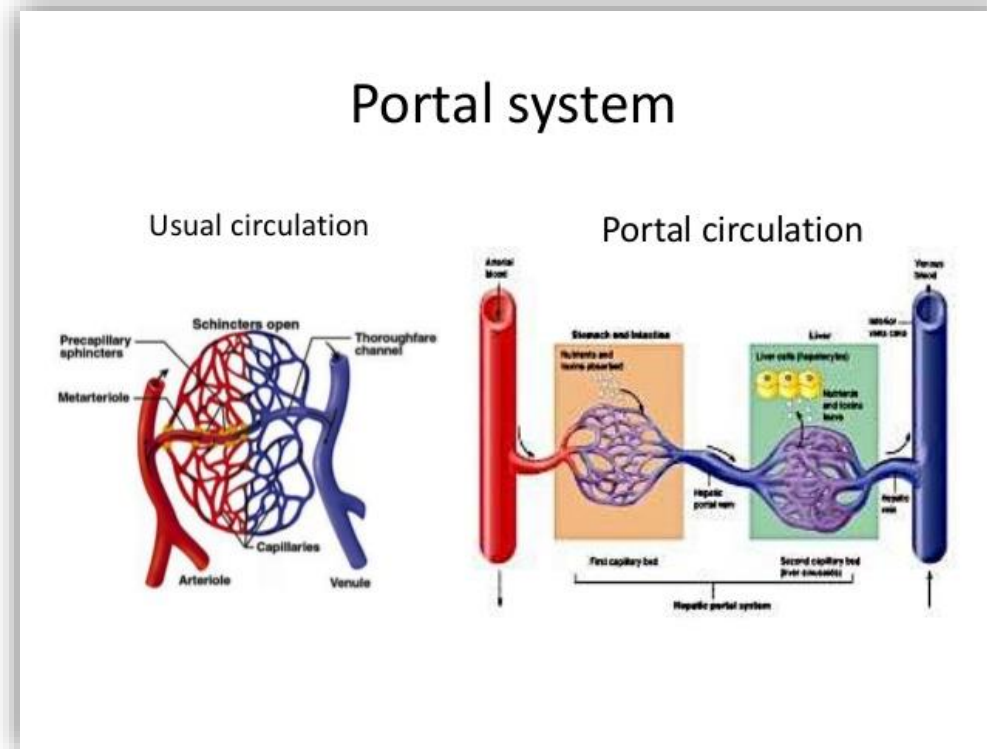
Blood is pumped from the left ventricle to all body tissues through the **AORTA AND ITS SYSTEMIC ARTERIES** which ultimately terminates in capillaries.

Oxygen poor blood circulates from the tissues to the **capillaries, venules & veins** back to the right atrium through the **Systemic Veins**.

BLOOD CIRCULATION

PORTAL Circulation

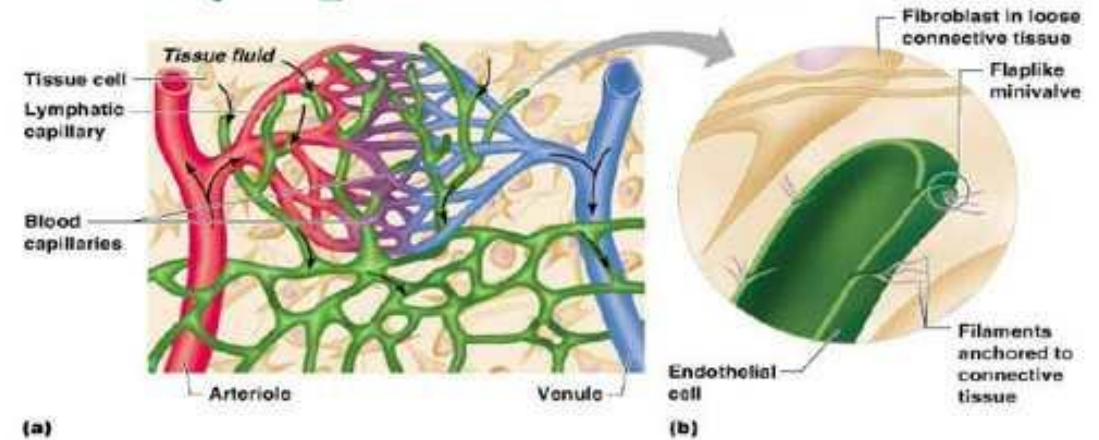
- It is a system of vessels interposed between **Two Capillary Beds**.
- It takes place in the **liver** and some endocrine glands (**Pituitary gland**).
- Veins leaving the gastrointestinal tract do not go direct to the heart.
- They pass to the **Portal Vein**.
- This vein enters the liver and breaks up into veins of diminishing size which ultimately join capillary like vessels (**Sinusoids**): *first capillary bed*.
- Venous blood enter *2nd capillary bed* then to smaller veins that leave the liver through hepatic veins.



LYMPHATICS

- ❖ Not all the blood entering a part returns by the way of veins.
- ❖ Much of it becomes **TISSUE FLUID (LYMPH)** returns by the way of vessels called **LYMPHATIC VESSELS**
- ❖ **Lymph** is a clear-to-white fluid **made** of: White blood cells, especially lymphocytes
- ❖ The lymphatic system is unique, in that it is a 1-way system that returns lymph fluid via vessels to the cardiovascular system.
- ❖ Lymph vessel have more valves than veins.
- ❖ In general superficial lymphatics follow veins, while deep lymphatics follow arteries

Lymphatic Vessel



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 include 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** are smallest vessels; connecting the arteries to the veins.
- ❖ **Sinusoids** are special type of capillaries.
- ❖ **The portal system** is composed of two sets of capillaries and found in the liver & pituitary *gland*

ANY QUESTION!



