

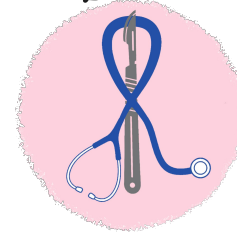
Lecture 5:



Cardiovascular System

- Main text
- **Red : Important**
- **Pink : in girls slides only**
- **Blue : in boys slides only**
- **Green : Doctors Notes**
- Grey : Extra info

Revised & Reviewed
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Objectives

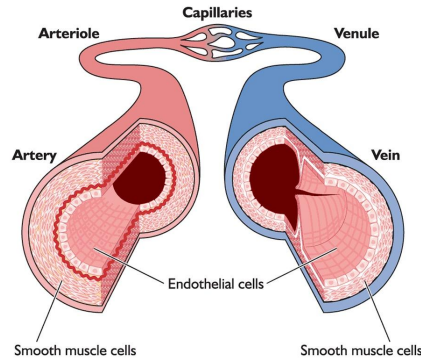
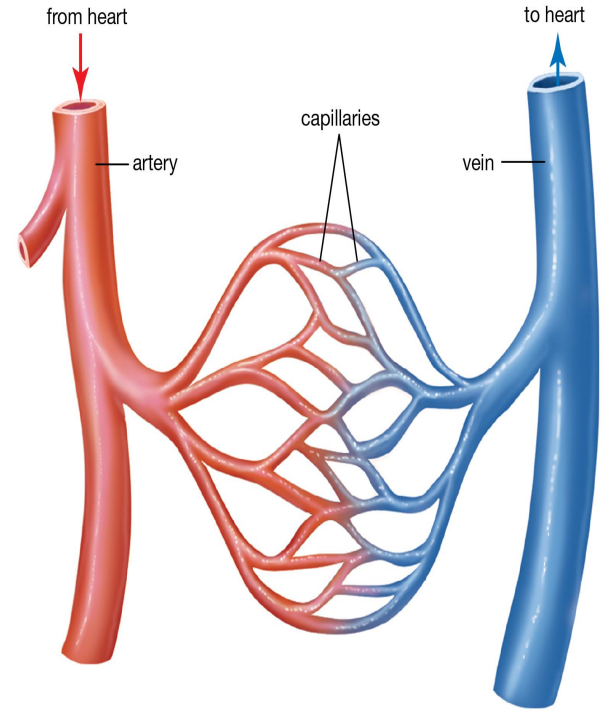
At the end of the lecture, students should be able to:

- 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**.

What does The CVS Consists of?

The parts of the cardiovascular system include:

- The **heart**, which is the organ that **pumps** the blood.
- A network of blood **vessels**: (3 TYPES)
 1. **Arteries**: The blood vessels that **take** blood away from the heart.
 2. **Veins**: Blood vessels that **return** blood to the heart.
 3. **Capillaries**: Very small vessels that lie **between** the arteries and veins.



The lining of the inner surface of blood vessels is called **endothelium**. *From team 39*

Functions of the CVS:

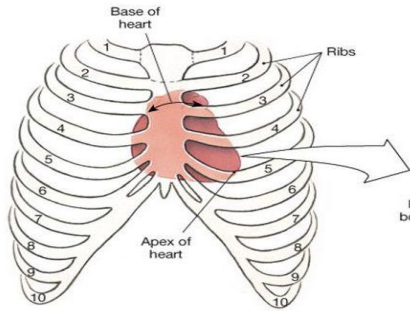
- It is a **transportation system** which uses the blood as the transport vehicle.
- Transports: (Both are **vital** for body **homeostasis**)
 - **To cells:** water, oxygen, nutrients and hormones
 - **Away from the cells:** wastes (including carbon dioxide)
- Helps maintain correct body **temperature**.
- The force to **move the blood** around the body is provided by the beating Heart.

The Heart:

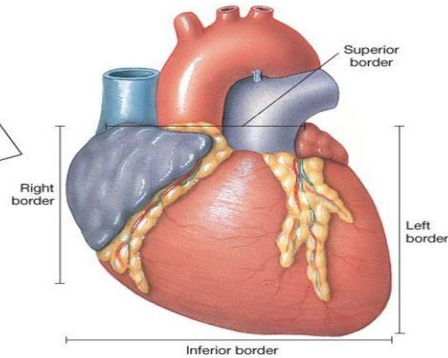
- It's a **hollow, cone** shaped muscular **pump** responsible for **circulation**.
- Is usually the size of **fist** of the same person.

• Has:

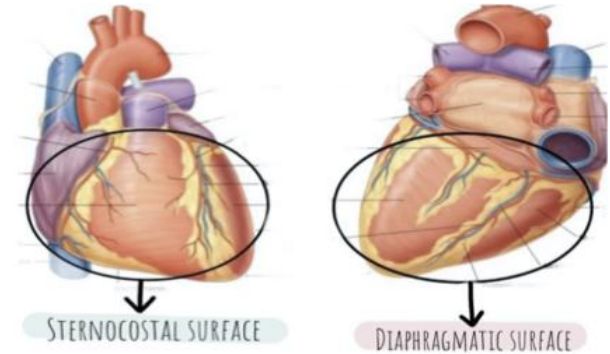
Apex & Base



Three borders: Right, Left, Inferior.



Two Surfaces: Sternocostal & Diaphragmatic.



Surface anatomy of the **apex**: In the **fifth intercostal space, 3.5 inches from the midline** (sternum)

Location of the Heart:

01



Lies obliquely (indirectly) in the **thorax cavity** between the two **pleural sacs**.

02



2/3 of the heart lies to the **left** of median plane.

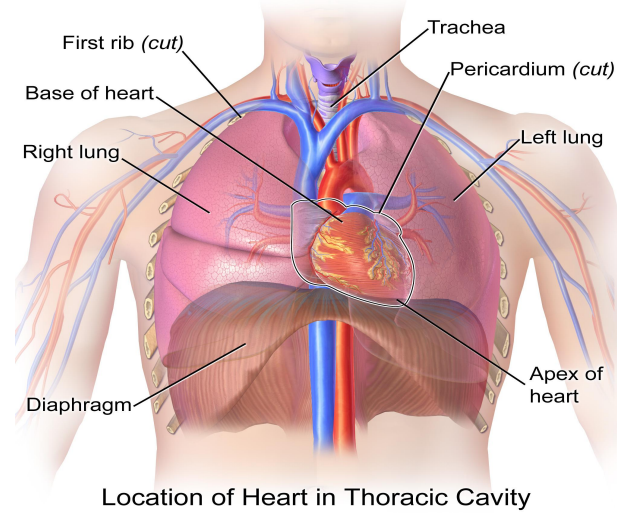
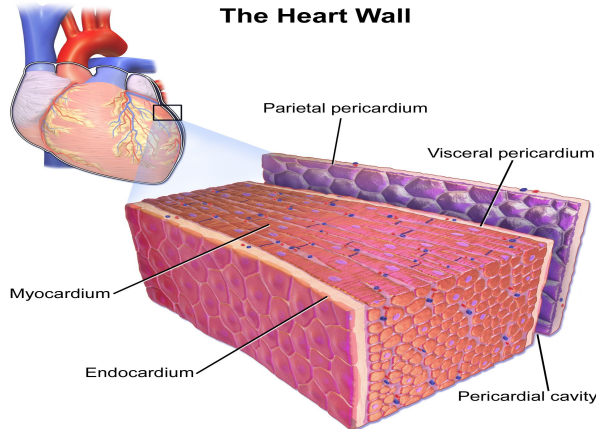
03



Lies in a centrally located partition Known as the **Middle Mediastinum**.

Enclosed by a **double sac** of serous membrane (**Pericardium**).

04



Recommended video:



Chambers of the heart

Recommended video:



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

Atria (الأذنين)

Superior in position.

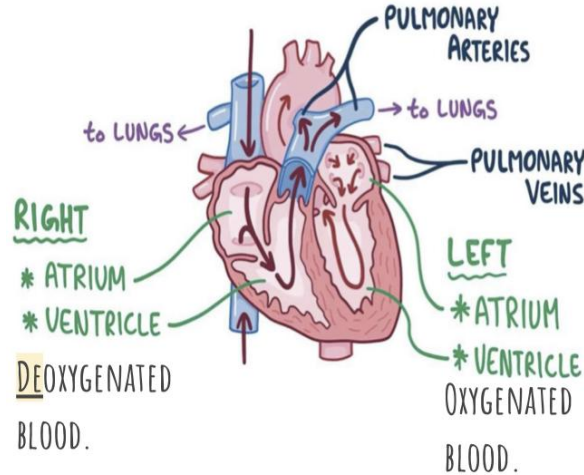
Thin walls

Receiving chambers

The **upper** part of each atrium is the **Auricle**.

Left Atrium receives **arterial blood** coming **from lungs**

Right Atrium is the **first** chamber receives the **venous blood entering the heart**.



Ventricles (البطينين)

Inferior in position.

Thick walls.

Discharging chambers (Actual Pump).

Their contraction propels blood **out of the heart into the circulation**.

Left ventricle forms the **APEX** of the heart.

Valves of the heart

4 VALVES (صمامات):

- **2 Atrioventricular:**

- **Between Atria & Ventricles.**
- **Allow** the blood to **flow From Atria To Ventricles** *one direction:

A) Tricuspid (Right AVV)

B) Bicuspid (Mitral) (Left AVV) (We use Mitral more often)

- **2 Semilunar (مثل الهلال):**

- **Between** ventricles and the great arteries leaving the heart:

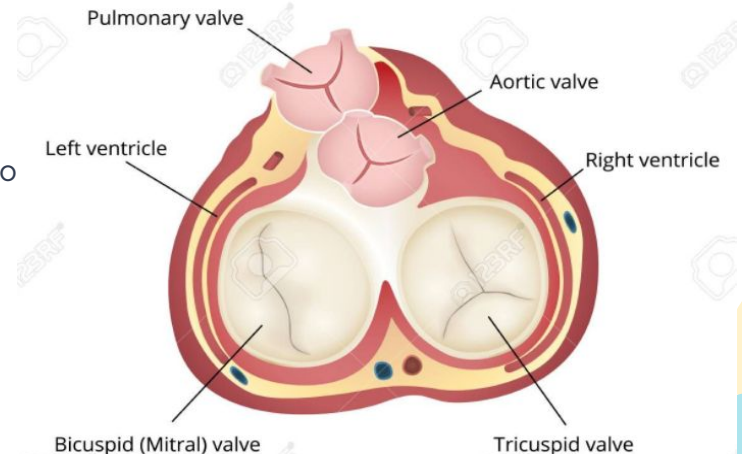
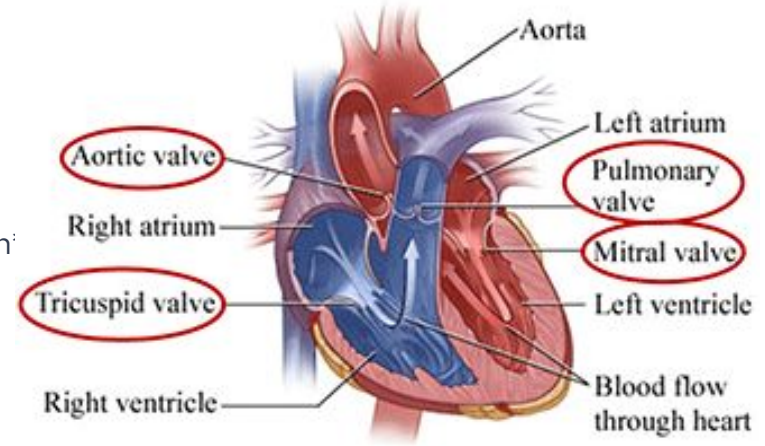
A) Aortic valve

Between **aorta & left ventricle**

B) Pulmonary valve

Between **pulmonary artery & right ventricle**

- **Allow** the blood to **flow From Ventricles To Arteries** *one direction



Recommended video:



Blood Vessels

Arteries:

- THICK Walled.
- DO NOT have valves.
- The smallest arteries are called **Arterioles**.
- Carry oxygenated blood from heart to body.

except: pulmonary artery (**deoxygenated**)

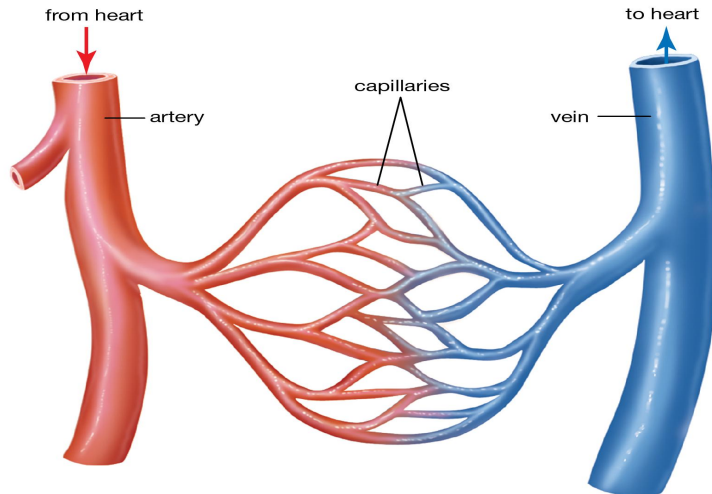
Veins:

- THIN walled.
- Many of them possess Valves.
- The smallest veins called **Venules**.
- Carry deoxygenated blood from body to heart.

Capillaries:

- The smallest blood vessels (**microscopic**).
- They connect the **Arterioles** to the **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**.



Arteries

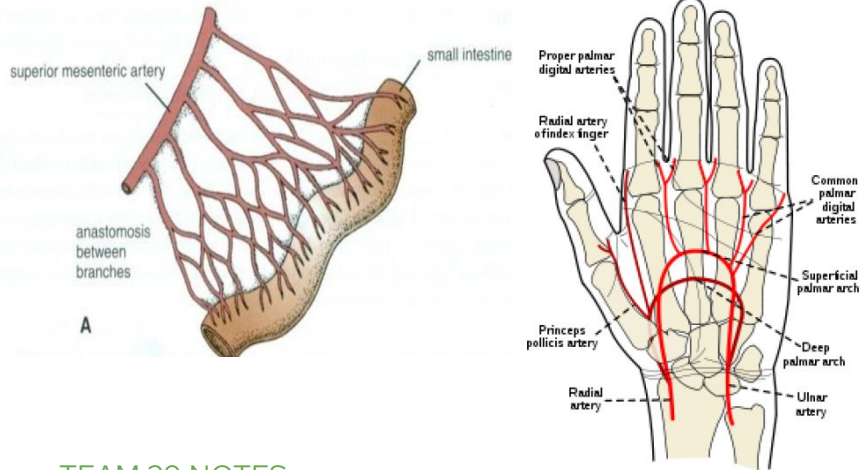
They transport blood from the **heart** and distribute it to the various **tissues** of the body through their branches.

Arterial Anastomosis:

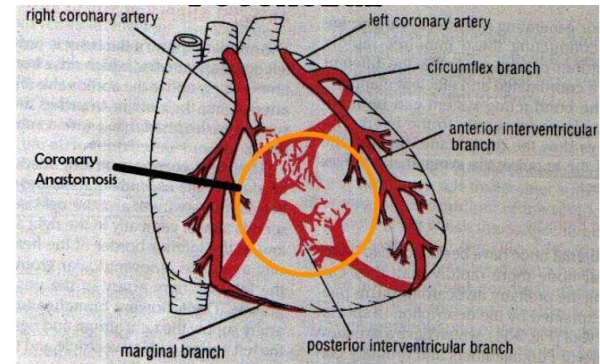
It is the joining of terminal branches of the arteries (Intestinal arteries)

Is a connection between two arteries, i.e. arteries meet END to END (arterio-arterial anastomosis)

1. Actual:



2. Potential:



TEAM 39 NOTES:

*Happens between terminal branches of one artery supplying two adjacent areas.

*Helps when one of the branches blocked.

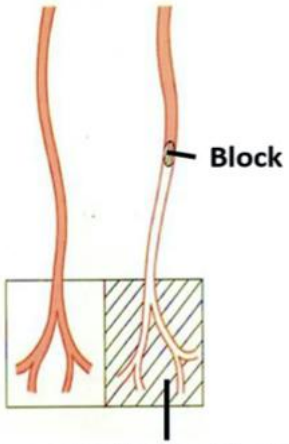
End arteries

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

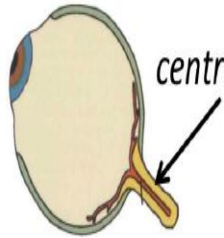
Anatomic End arteries:

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

Anatomic End Arteries



Area supplied by blocked artery undergoes Ischemic necrosis

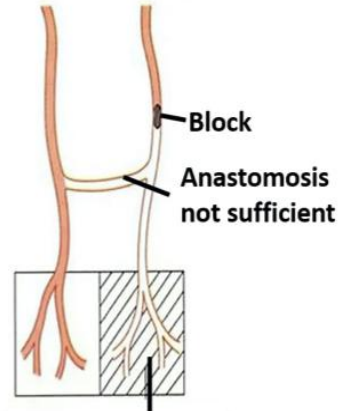


Examples:
central artery of **retina** → blindness
branches of **cerebral** arteries in brain → infarct / stroke

Functional End arteries:

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

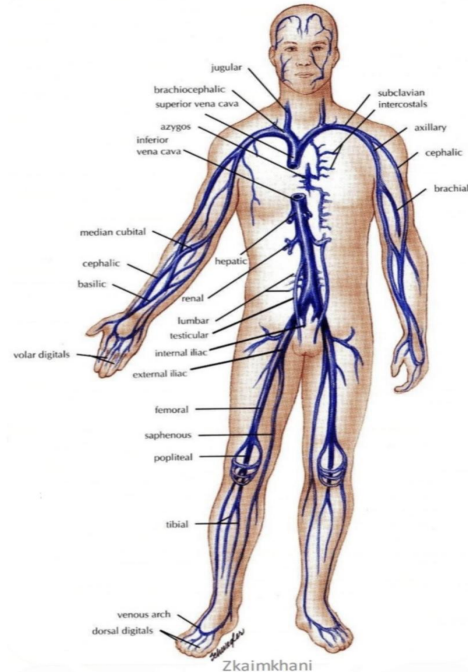
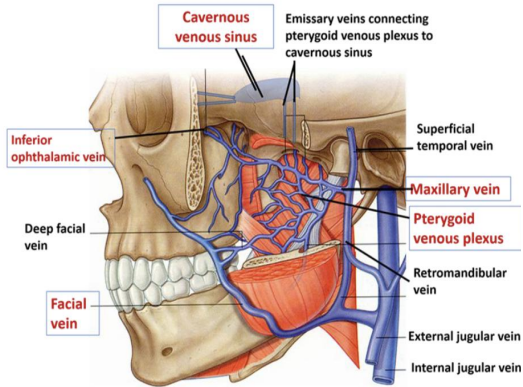
Functional End Arteries



Area supplied by blocked artery undergoes Ischemic necrosis

Veins:

- ❖ They transport blood back to the heart.
- ❖ The **smaller venules (Tributaries) unite to form** larger veins which commonly join with one another forming **Venous Plexuses**.
- ❖ Veins carry **deoxygenated** blood **except** 4 Pulmonary veins opening in the **left atrium** carry **oxygenated** blood.

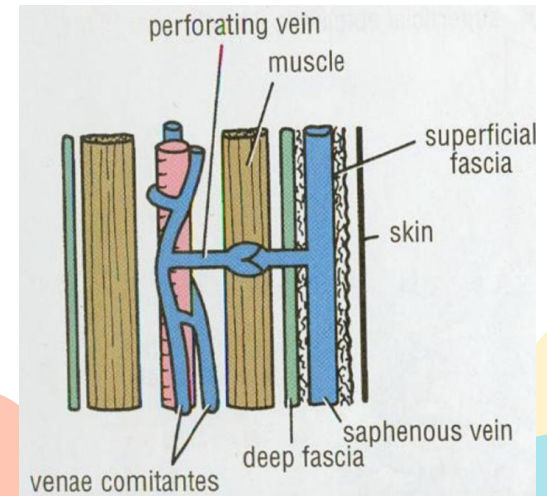


Veins (2 types) :

1- Venae comitantes

Deep veins accompany medium sized deep arteries, usually two.

2- Superficial Veins



Anastomosis :

Circulatory Anastomosis

Arterio-arterial

Actual

e.g.
-Palmar arch
-Intestine

Potential

e.g.
-Coronary

Veno-venous

Arterio-venous

- ❑ Direct connection between the arteries and veins **without the intervention of capillaries.**
- ❑ Example: Tips of fingers and toes.
- ❑ **May have a role in temperature regulation.**
- ❑ **We have two types to connect between vein and artery:**
 - 1) **Capillaries**
 - 2) **Arteriovenous Anastomosis**

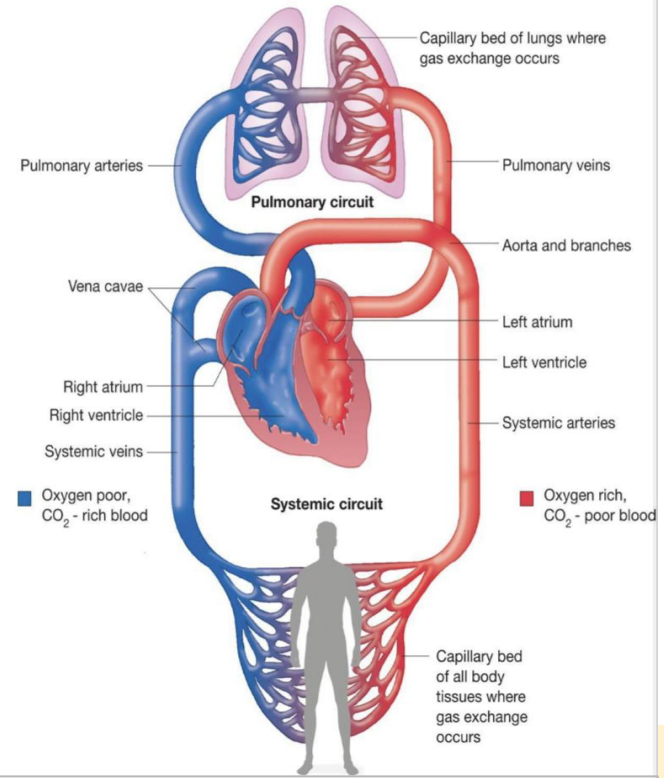
Blood Circulation:

Cardiopulmonary

- ❑ Takes place **between the heart and lungs**.
- ❑ The **right side** of the heart (**right atrium and ventricle**) receives oxygen poor blood (**Deoxygenated**).
- ❑ This blood is **pumped** from the heart through the **Pulmonary Trunk** to the **lungs**.
- ❑ **Gas Exchange** takes place in the **lungs**.
- ❑ It returns to the left side of the heart (**left atrium and ventricle**) through **4 pulmonary veins**.

Systemic

- ❑ Takes place between the **heart and each cell** of the body.
- ❑ The **left side of the heart** (**left atrium and ventricle**) receive the **Oxygenated blood from the lungs**.
- ❑ This blood is **pumped** from the left ventricle to all body tissues through the **Aorta** and its **systemic arteries** which ultimately terminates in **capillaries**.
- ❑ **Deoxygenated blood** circulates from the tissues to the capillaries, venules & veins back to the **right atrium** through the systemic veins.



Deoxygenated blood = Poor blood

Sinusoids :

- ❑ Thin walled blood vessels like capillaries.
- ❑ Wider with irregular cross diameter.
- ❑ They are the capillaries of the liver
- ❑ Wide Capillaries with discontinuous endothelium.

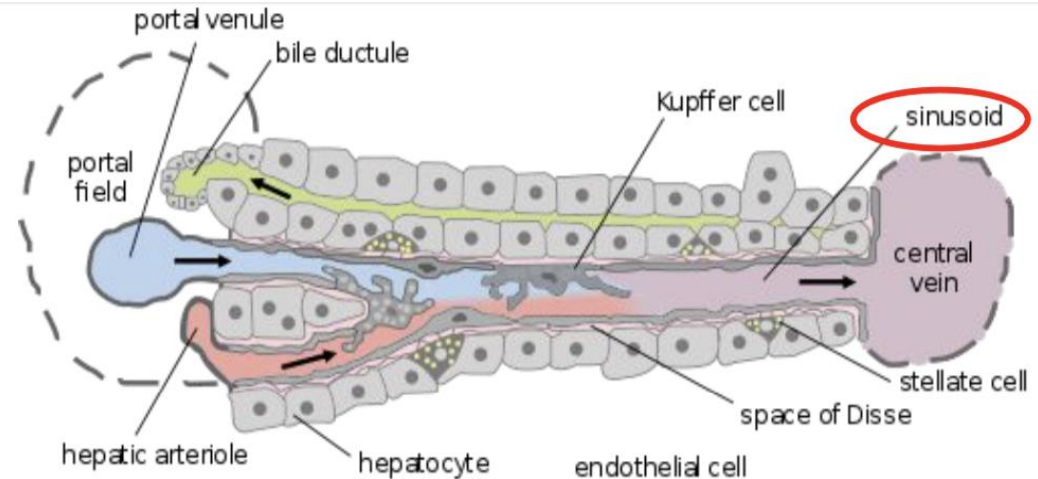
Digested food: portal vein → Sinusoids → Liver

Numerous in:

1. Liver
2. Spleen
3. Bone marrow
4. Pituitary gland

-The blood doesn't go straight to the heart because it contains food with venous blood.

-Note: The sinusoids will get rid of the food by giving it to the liver cells which are surrounded by them.



Portal Circulation:

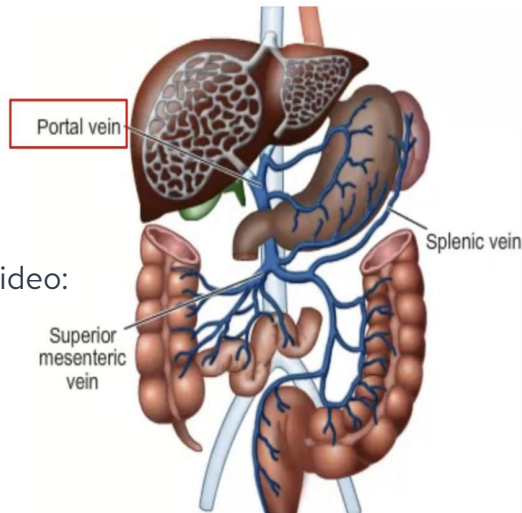
GIT tract

Portal Vein

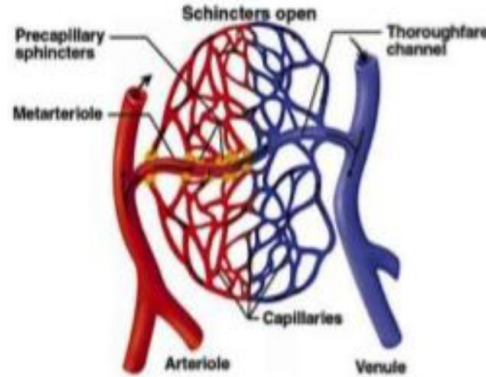
Liver

Sinusoids

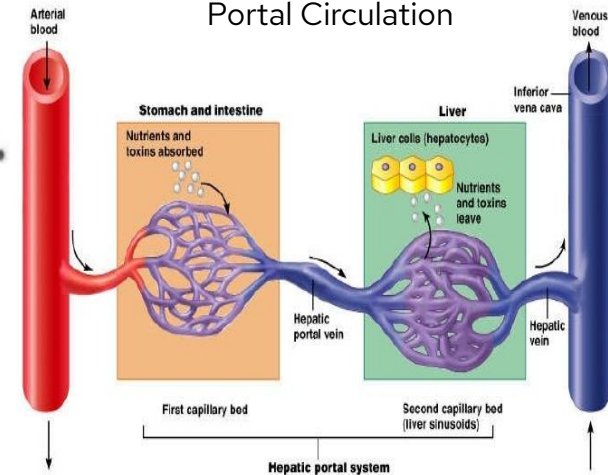
- ❑ Its a system of vessels interposed between **Two Capillary Beds**.
- ❑ It takes place in the **liver** and some **endocrine glands (Pituitary gland)**.
- ❑ Veins leaving the gastrointestinal tract **do not go directly** to the heart, they pass to the **Portal Vein**.
- ❑ This vein (**Portal Vein**) 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**.



Usual circulation



Portal Circulation



Recommended video:



Lymphatics: IN BOYS SLIDES ONLY

Not all blood entering a part returns by the way of veins

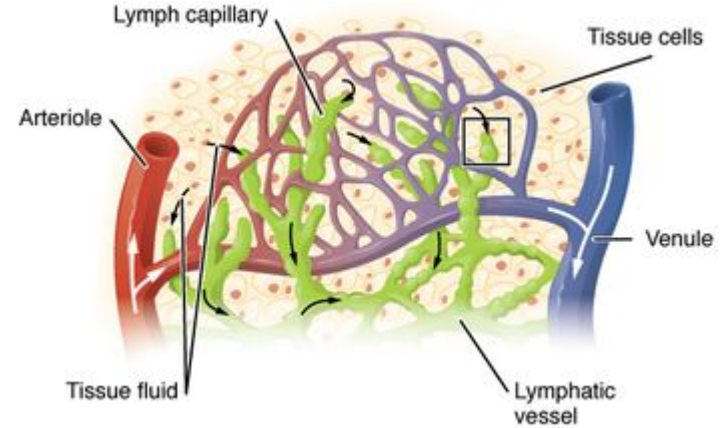
Much of it becomes **Tissue Fluid (Lymph)** returns by the way of vessels called **Lymphatic vessels**

Lymph is a clear-to-white fluid made of: white blood cells, especially lymphocytes


The lymphatic system is unique, in that it is a **One-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**



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 a **special type of capillaries**.
 - The portal system is composed of **two sets of capillaries**.
 - It's found in the **liver and pituitary gland**.
- 

MCQs:

1- Part of the CVS that returns blood to the heart:

A- Capillaries

B- Veins

C- Arteries

D- Arterio

2- A clear-to-white fluid made of: white blood cells, especially lymphocytes:

A-Lymph

B- Sinusoids

C- Plasma

D- Venae

3- One of them is not a border of the heart:

A- Left

B- Inferior

C- posterior

D- right

4- The heart has:

A- 5 chambers

B- 3 chambers

C- 2 chambers

D- 4 chambers

5- Its a system of vessels interposed between Two Capillary Beds:

A- Venous System

B- Portal
Circulation

C- Arterial System

D- Systemic
Circulation

Answers

1

B

2

A

3

C

4

D

5

B

Team members:

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