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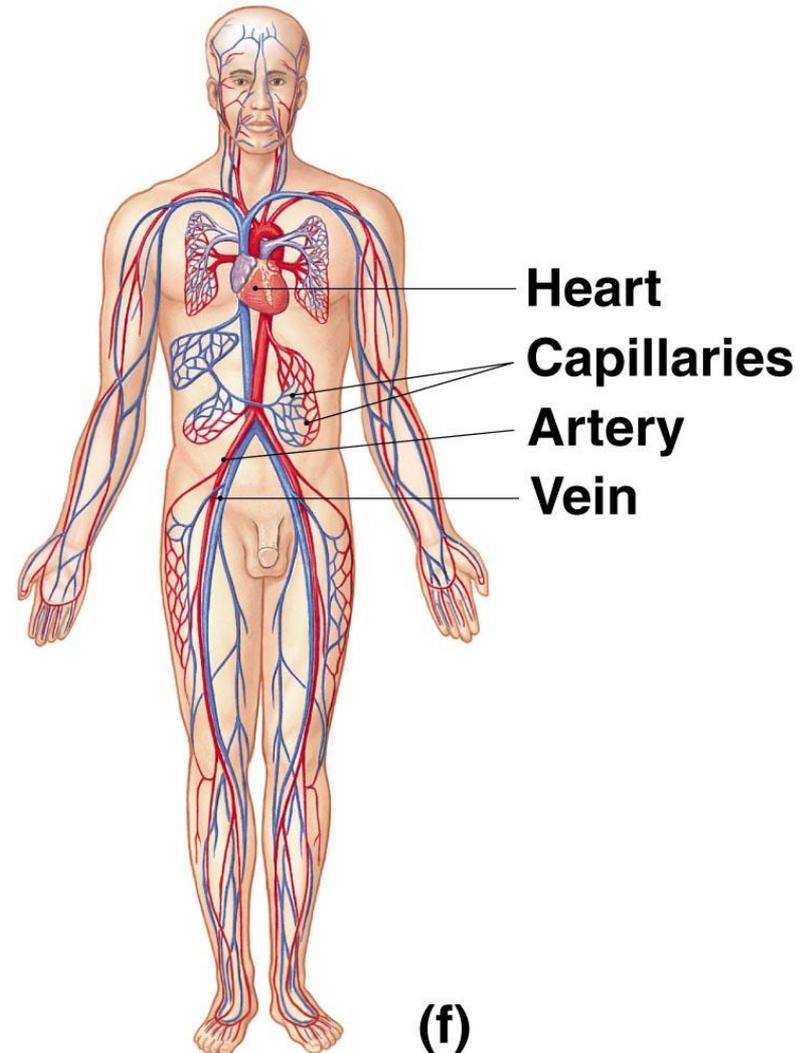
1st Year Pharm D

Introduction to the Human Cardiovascular System

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INTRODUCTION

- ▶ The cardiovascular system is transport system of body
- ▶ It comprises blood, heart and blood vessels.
- ▶ The system supplies nutrients to and remove waste products from various tissue of body.
- ▶ The conveying media is liquid in form of blood which flows in close tubular system.



FUNCTION OF CARDIOVASCULAR SYSTEM

- ▶ **Transport nutrients, hormones**
- ▶ **Remove waste products**
- ▶ **Gaseous exchange**
- ▶ **Immunity**
- ▶ **Blood vessels transport blood**
 - **Carries oxygen and carbon dioxide**
 - **Also carries nutrients and wastes**
- ▶ **Heart pumps blood through blood vessels**

COMPONENTS OF CARDIOVASCULAR SYSTEM

- **BLOOD**

- **HEART**

- **BLOOD VESSELS**

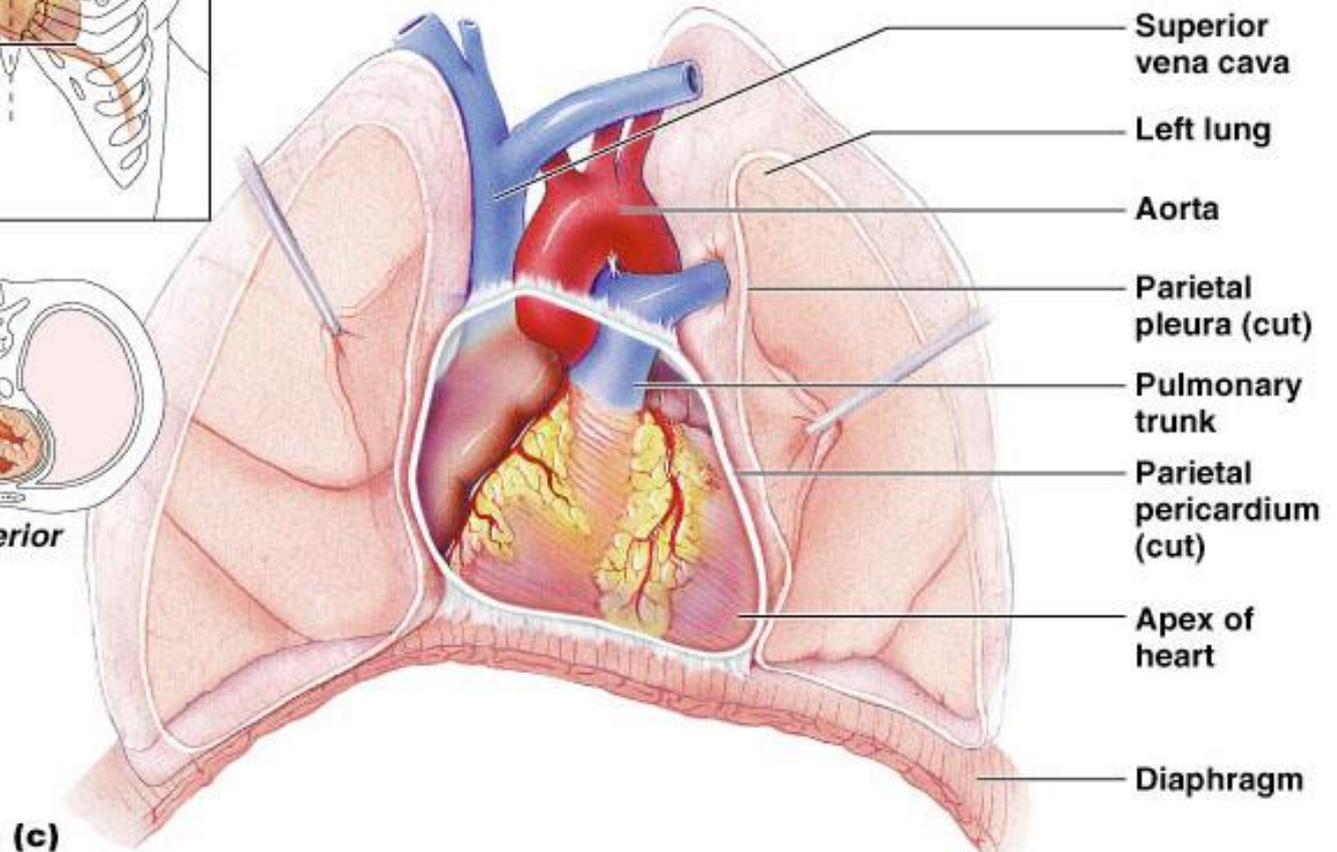
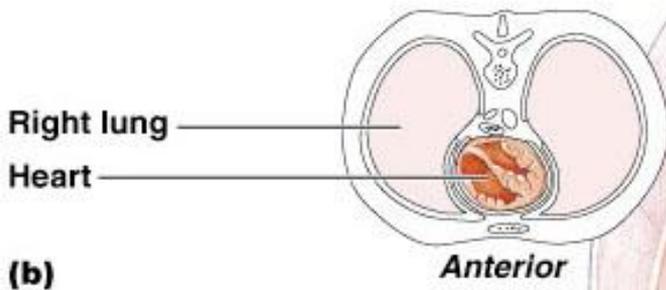
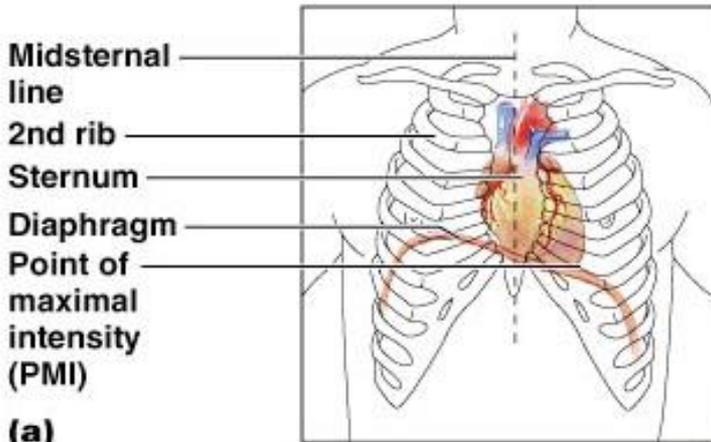
BLOOD

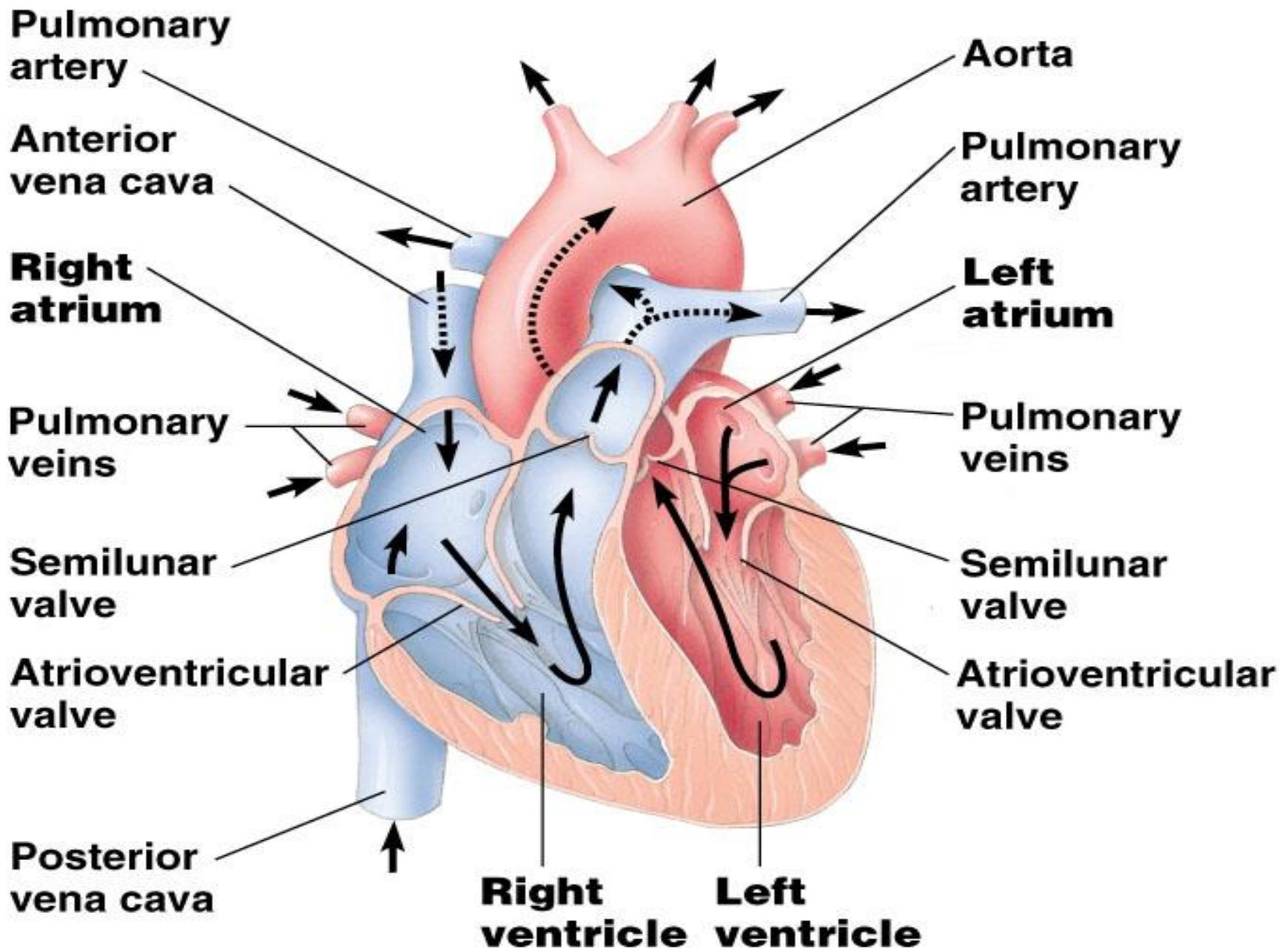
- The Blood: Blood cells & Plasma**
- Blood cells**
 - 1- Erythrocytes - Red Blood Cells**
 - 2- Leucocytes**
 - 3- Thrombocytes**
- Plasma is fluid portion**

HEART

- **Heart is a four chambered, hollow muscular organ approximately the size of your fist**
- **Location:**
 - **Superior surface of diaphragm**
 - **Left of the midline**
 - **Anterior to the vertebral column, posterior to the sternum**

HEART





FUNCTIONS OF THE HEART

- **Generating blood pressure**
- **Routing blood**
 - Heart separates pulmonary and systemic circulations**
- **Ensuring one-way blood flow**
 - Heart valves ensure one-way flow**
- **Regulating blood supply**
 - Changes in contraction rate and force match blood delivery to changing metabolic needs**

BLOOD VESSELS

- **Blood Vessels -A closed network of tubes**

- **These includes:**



Arteries



Capillaries



Veins

BLOOD VESSELS

-Arteries(Distributing channel)

- **Thick walled tubes**
- **Elastic Fibers**
- **Circular Smooth Muscle**

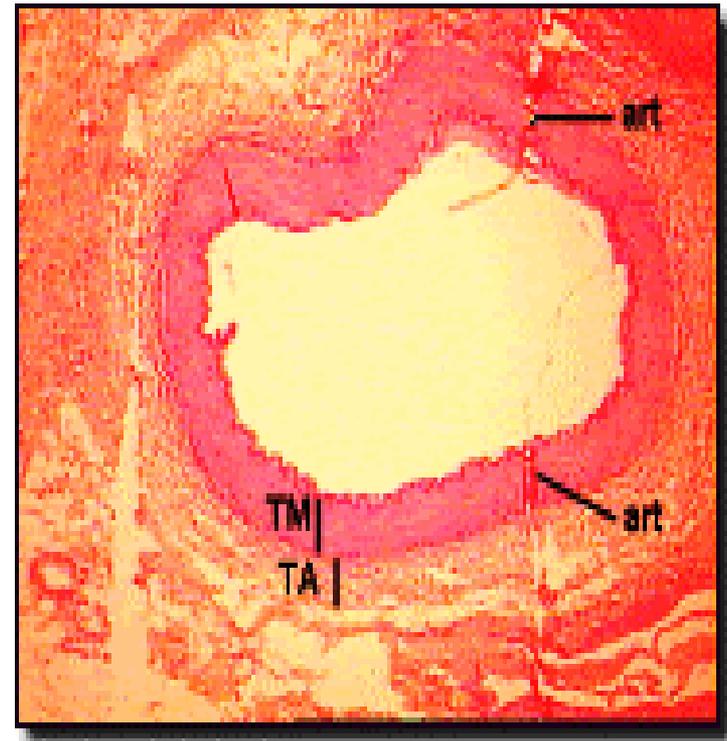
–Capillaries (microscopic vessels)

- **One cell thick**
- **Serves the Respiratory System**

–Veins (draining channel)

BLOOD VESSELS

- **General structure**
 1. **Tunica intima**
 2. **Tunica media**
 3. **Tunica adventitia**

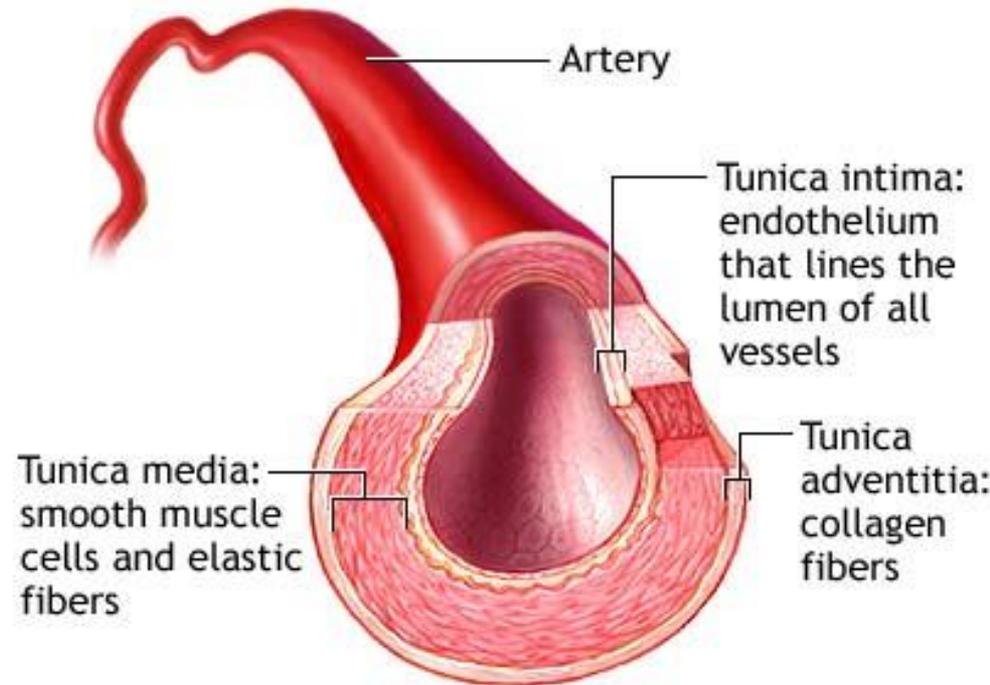


CLASSIFICATION OF BLOOD VESSELS

- **Conducting Vessels**
- **Distributing Vessels**
- **Resistance Vessels**
- **Exchange Vessels**
- **Capacitance / Reservoir Vessels**

ARTERIES

- ▶ Blood vessels that carry blood away from the heart are called arteries.
- ▶ They are the thickest blood vessels and they carry blood high in oxygen known as oxygenated blood (oxygen rich blood).



ARTERIES

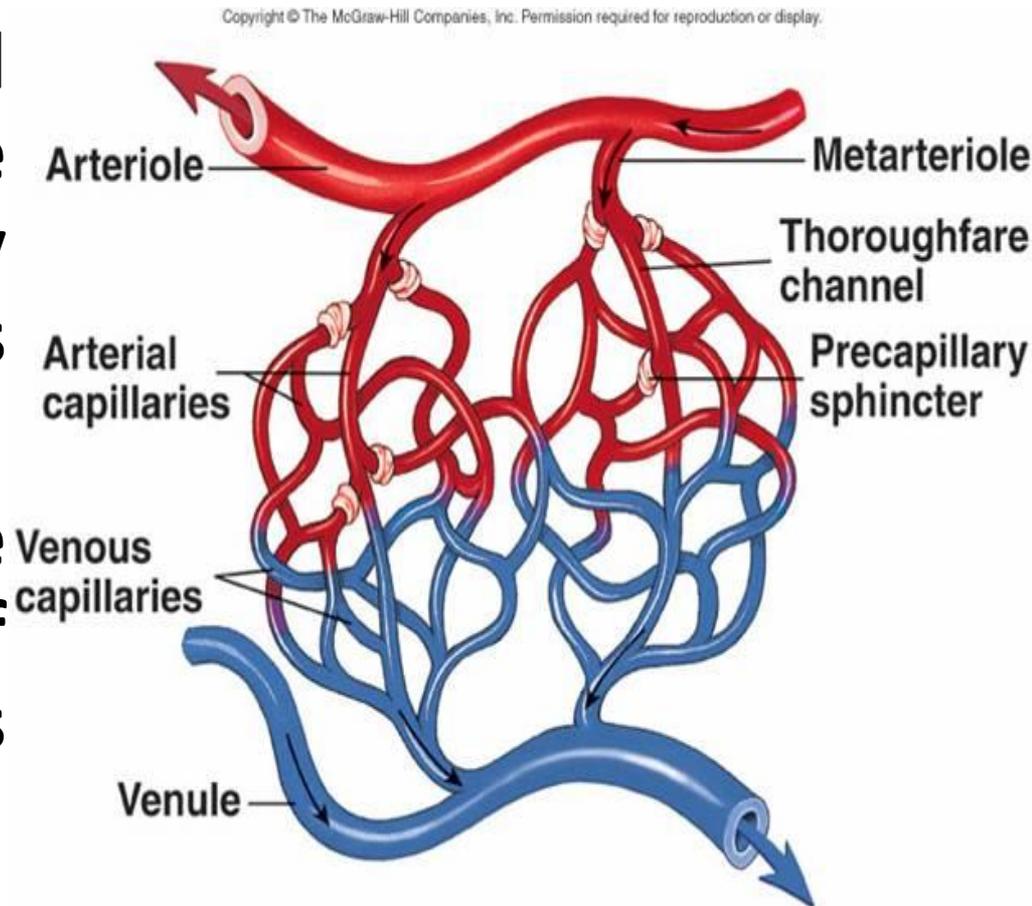
- **Accompanied by vein and nerves**
- **Lumen is small**
- **No valves**
- **Repeated branching**

CLASSIFICATION OF ARTEIEES

- **Elastic- e.g. (Aorta & its Major branches)**
- **Muscular -e.g.(Renal, Testicular, Radial, Tibial etc.)**
- **Arterioles (<0.1 mm)-**
 - Terminal arterioles**
 - Meta-arterioles**
 - Thoroughfare**
 - channel/ preferred**

CAPILLARIES (5-8 micron)

- The smallest blood vessels are capillaries and they connect the arteries and veins.
- This is where the exchange of nutrients and gases occurs.



BODY CONTAINS TWO KINDS OF CAPILLARIES

- **CONTINUOUS-SKIN, LUNG, SMOOTH MUSCLE, CONNECTIVE TISSUES**
- **FENESTRATED- PANCREAS, ENDOCRINE GLANDS, SMALL INTESTINE, CHOROID PLEXUS, CILIARY PROCESS etc.**

SINUSOIDS

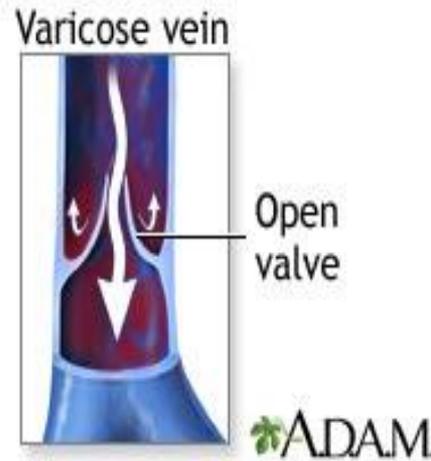
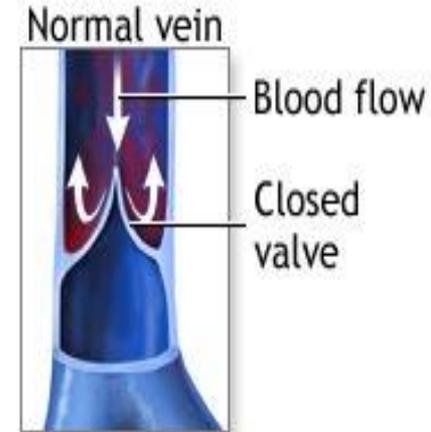
- SINUSOIDS**- Large irregular vascular space (30-40 micron) eg. Liver, Spleen, Bone marrow, suprarenal, Parathyroid etc.

VEINS

- Blood vessels that carry blood back to the heart are called veins.
- They have one-way valves which prevent blood from flowing backwards.
- They carry blood that is high in carbon dioxide known as deoxygenated blood (oxygen poor blood).



Varicose veins



VEINS

- **Thin Walled**
- **Large irregular lumen**
- **Have valves**
- **Dead space around**
- **Types:**

Large

Medium

Small

VEINS

- **Veins without valves:**
 - **SVC & IVC**
 - **Hepatic, Renal**
 - **Uterine, Ovarian not Testicular**
 - **Facial**
 - **Pulmonary**
 - **Umbilical**
 - **Emissary**
 - **Portal Veins <2mm**

VEINS

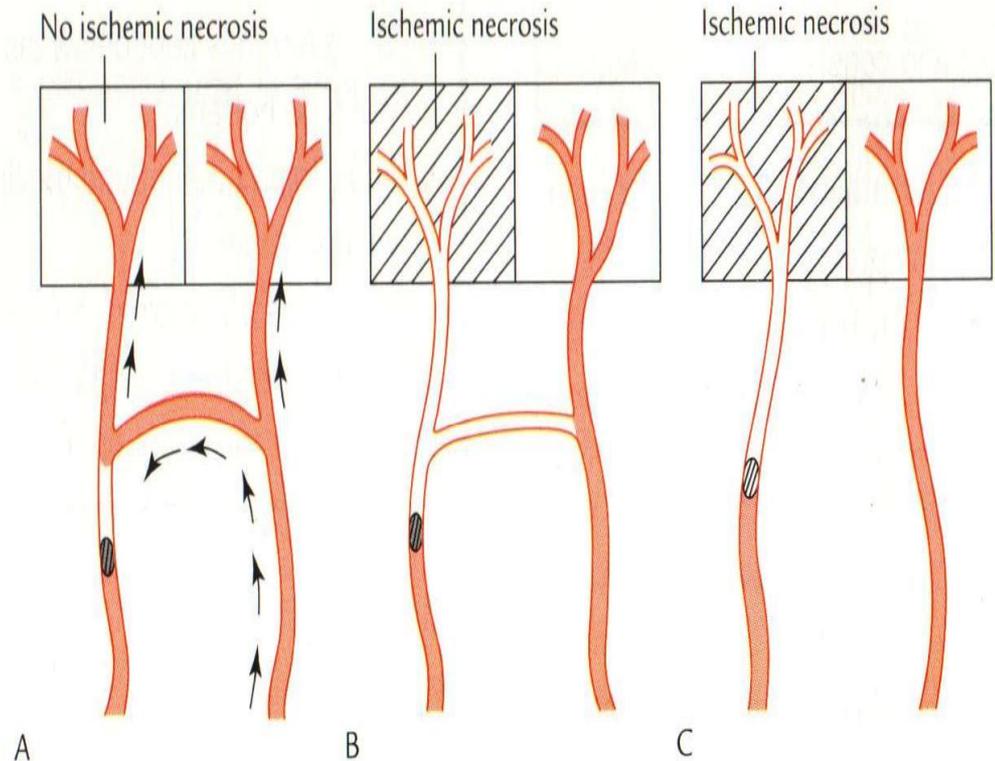
- **Veins without Muscular tissue:**
 - **Dural venous sinuses**
 - **Pial Veins**
 - **Retinal**
 - **Veins of erectile tissue of sex organs**
 - **Veins of spongy bones**

VEINS

- **Factors responsible for venous return:**
 - 1. Muscle contraction**
 - 2. Negative intrathoracic pressure**
 - 3. Pulsation of arteries**
 - 4. Gravity**
 - 5. Valves**

ANASTOMOSIS

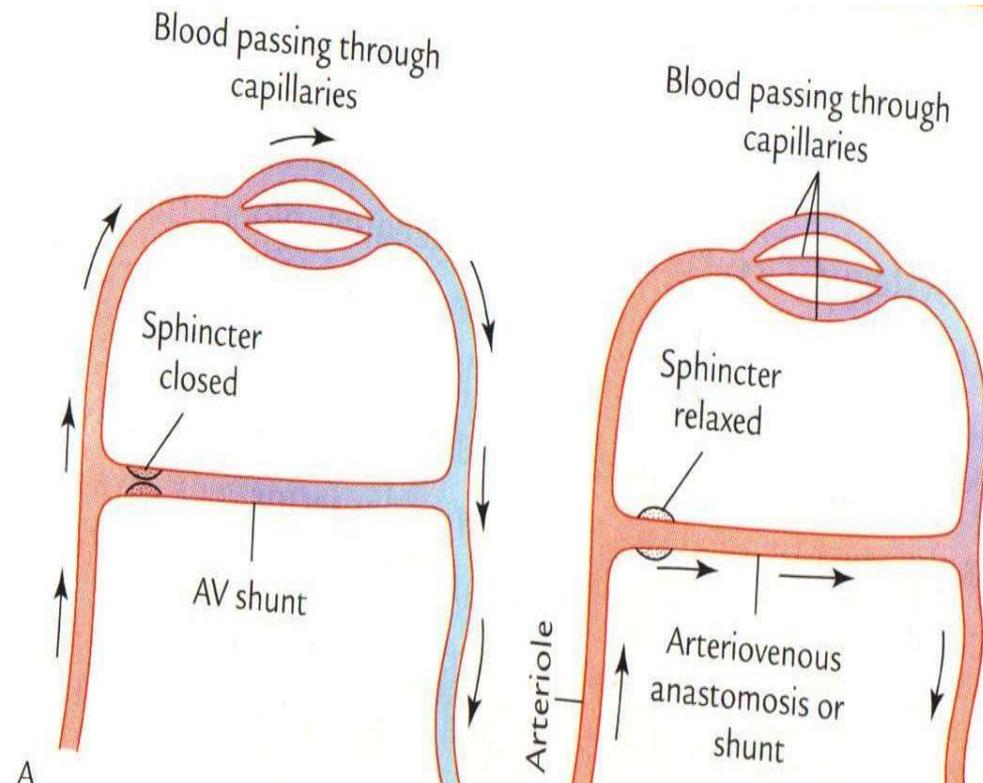
- **Communication between vessels**
- **ARTERIAL:**
 - Actual (end to end & convergent)-Palmar, plantar, Circle of Willis, Labial Intestinal arcade, etc.
 - Potential-Coronary, around joints etc.



ANASTOMOSIS

- **ARTERIOVENOUS ANASTOMOSIS:**

1. Skin of nose
2. Lips
3. External Ear
4. Mucus membrane of GI & nose
5. Erectile tissue of sex organ
6. Thyroid
7. Tongue



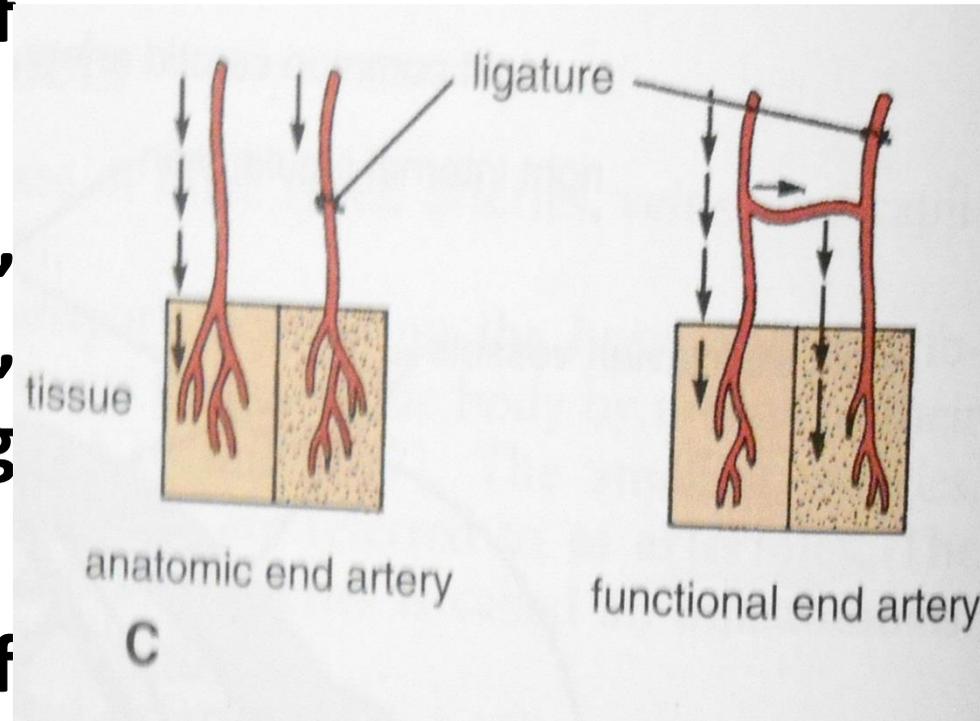
END ARTERIES

- **END ARTERIES:**

1. **Central artery of retina**

2. **Arteries of spleen, liver, kidneys, metaphyses of long bones**

3. **Central branches of cerebral cortex**



CIRCULATION

- Coronary circulation – the circulation of blood within the heart.**
- Pulmonary circulation – the flow of blood between the heart and lungs.**
- Systemic circulation – the flow of blood between the heart and the cells of the body.**
- Fetal Circulation**

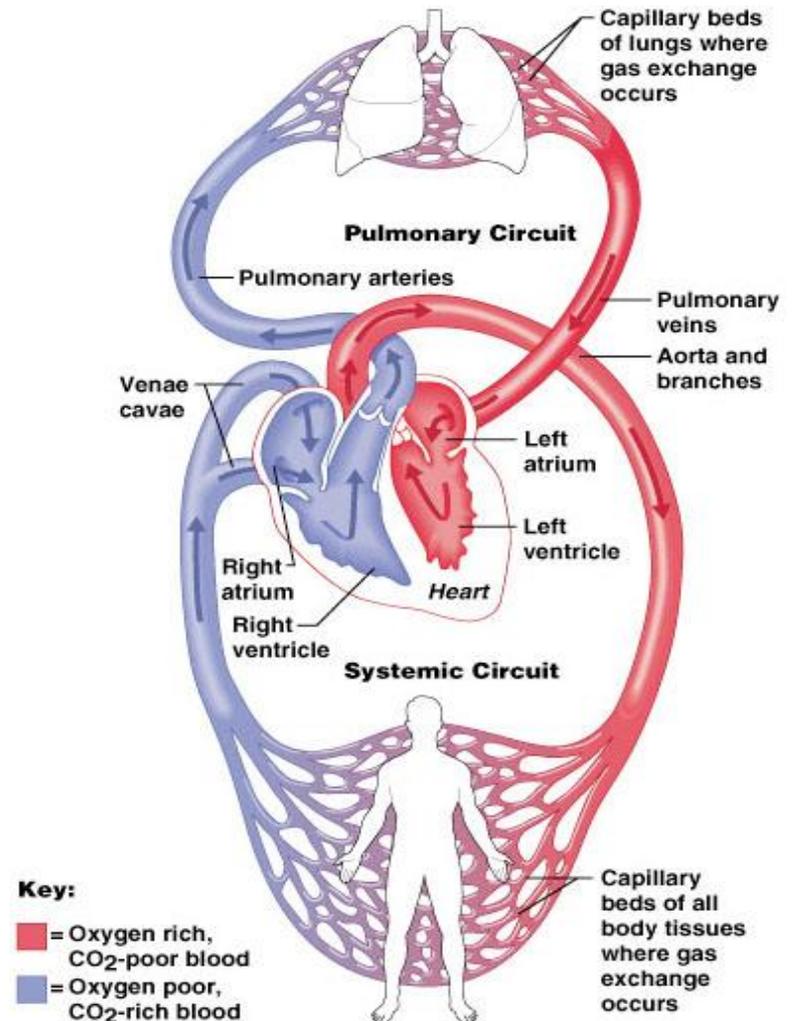
SYSTEMIC AND PULMONARY CIRCULATION

Pulmonary circulation

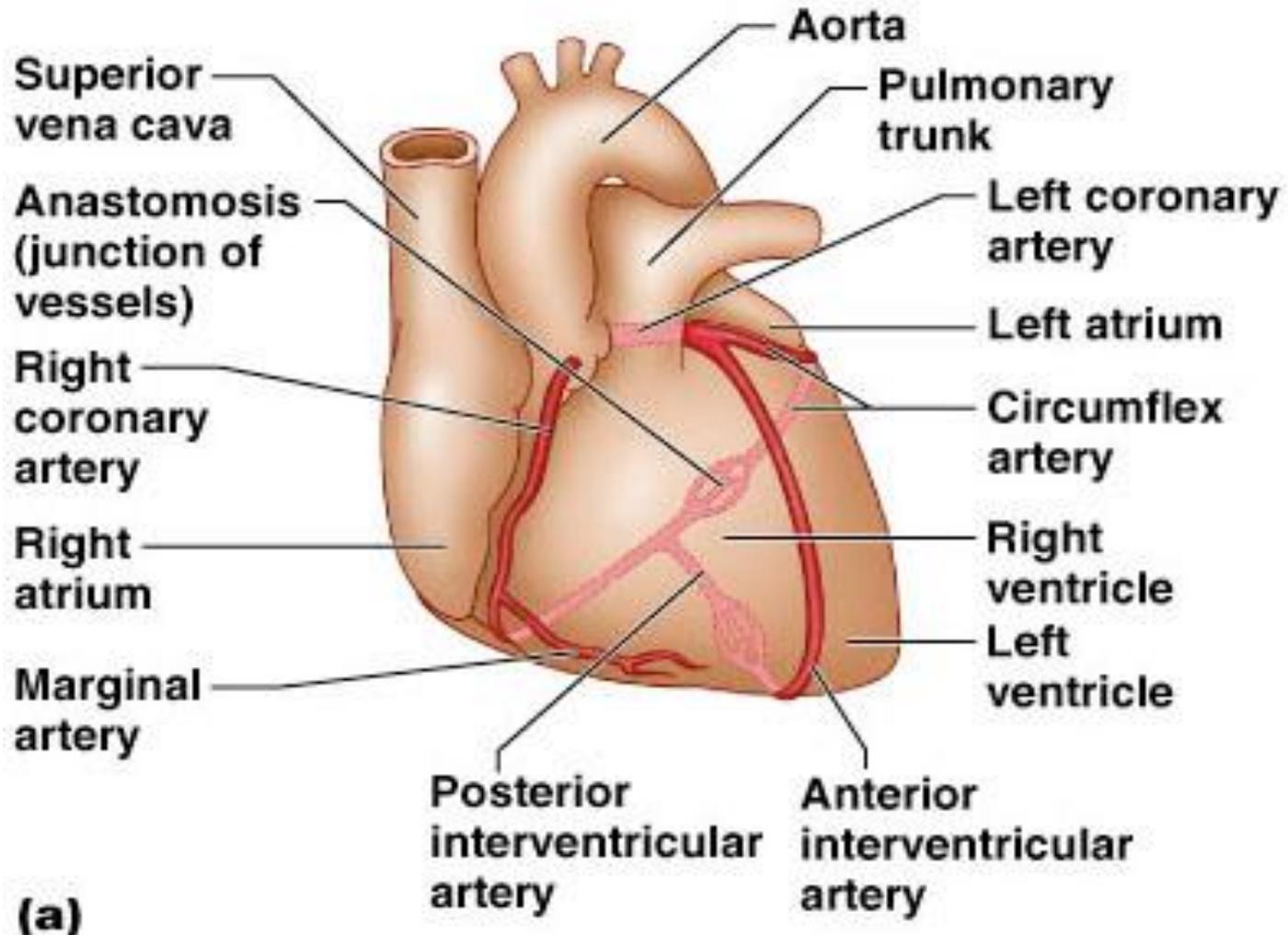
The flow of blood between the heart and lungs.

Systemic circulation

The flow of blood between the heart and the cells of the body.

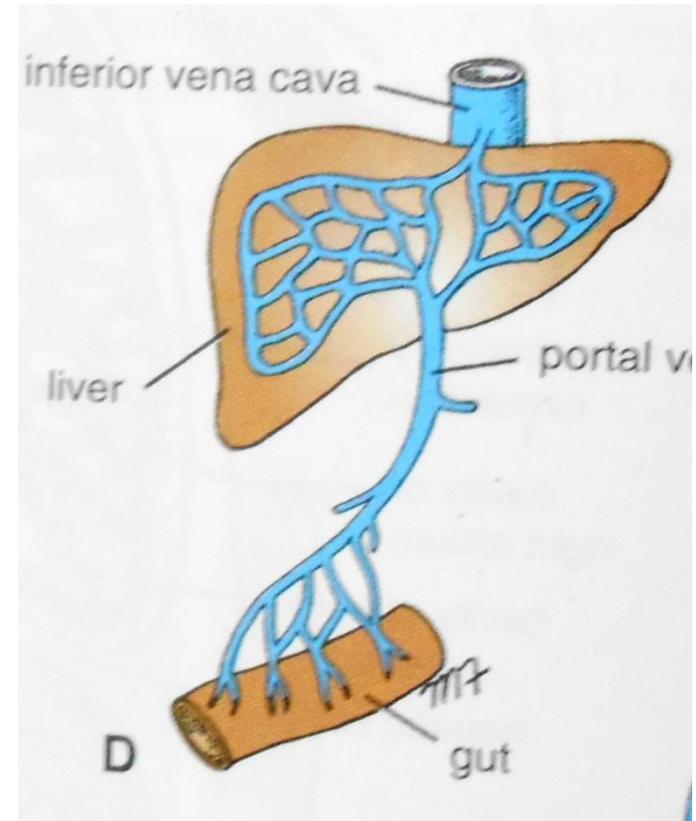


CORONARY CIRCULATION: ARTERIAL SUPPLY



PORTAL CIRCULATION

► Portal circulation - the flow of blood between two sets of capillaries before draining in systemic veins.



FETAL CIRCULATION

