

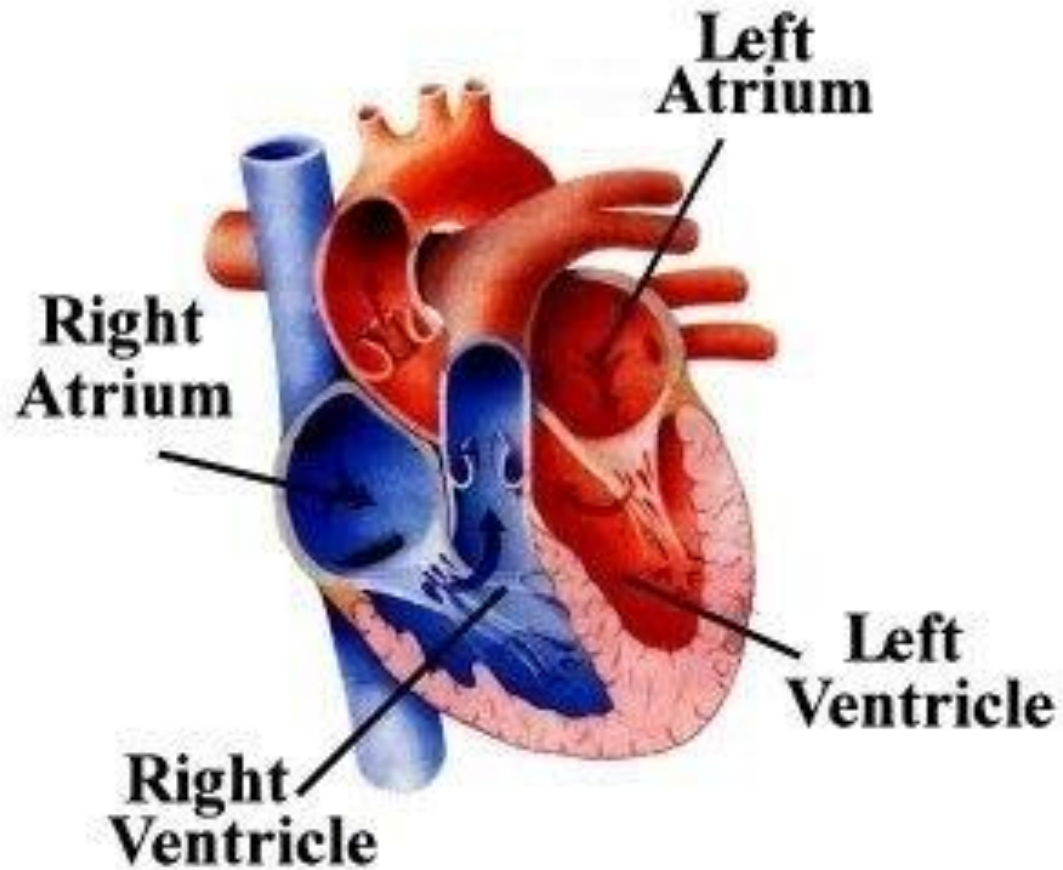
CIRCULATORY SYSTEM IN HUMAN

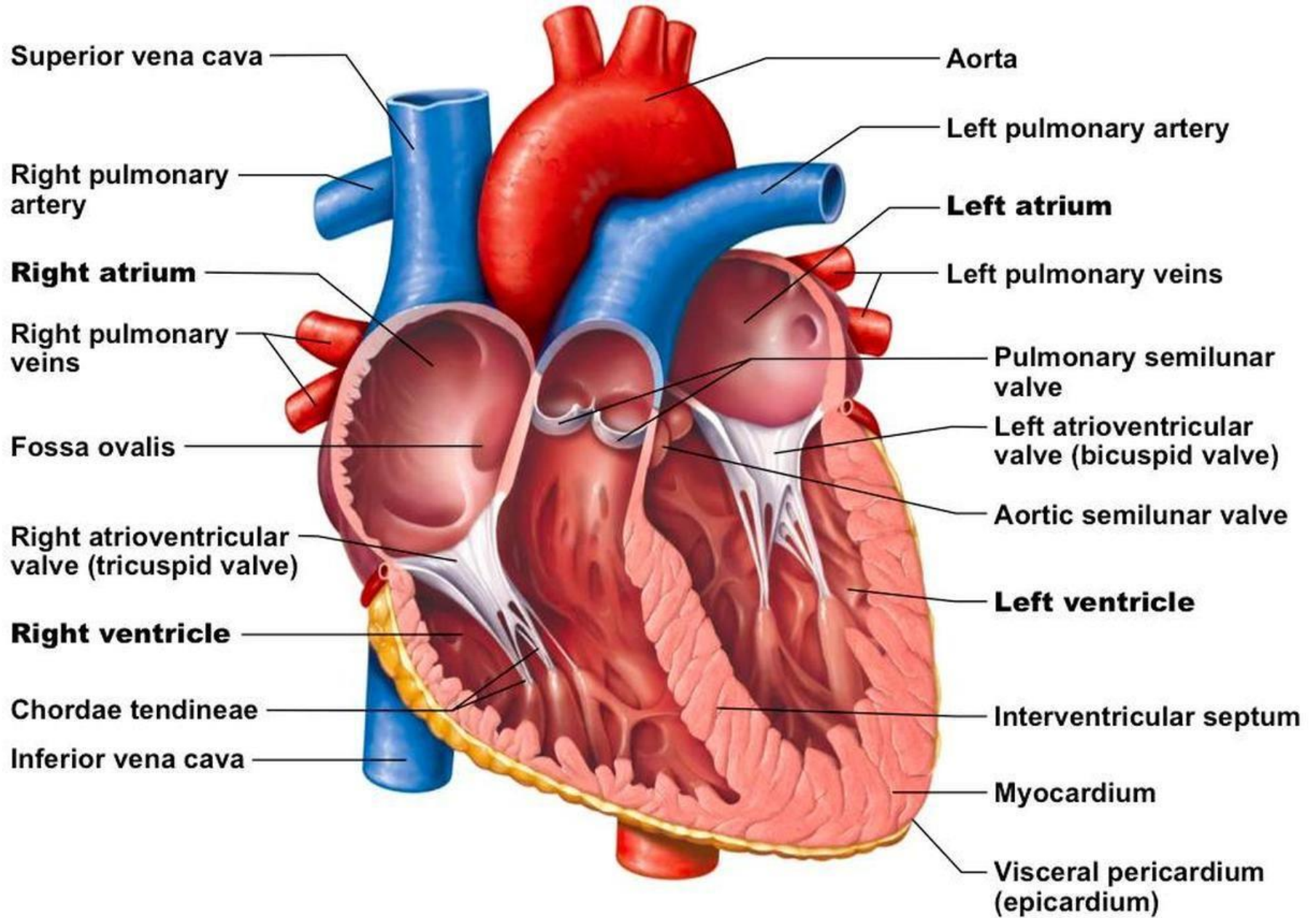
Presented by
Dr Sanjoy Deka

Blood circulatory system

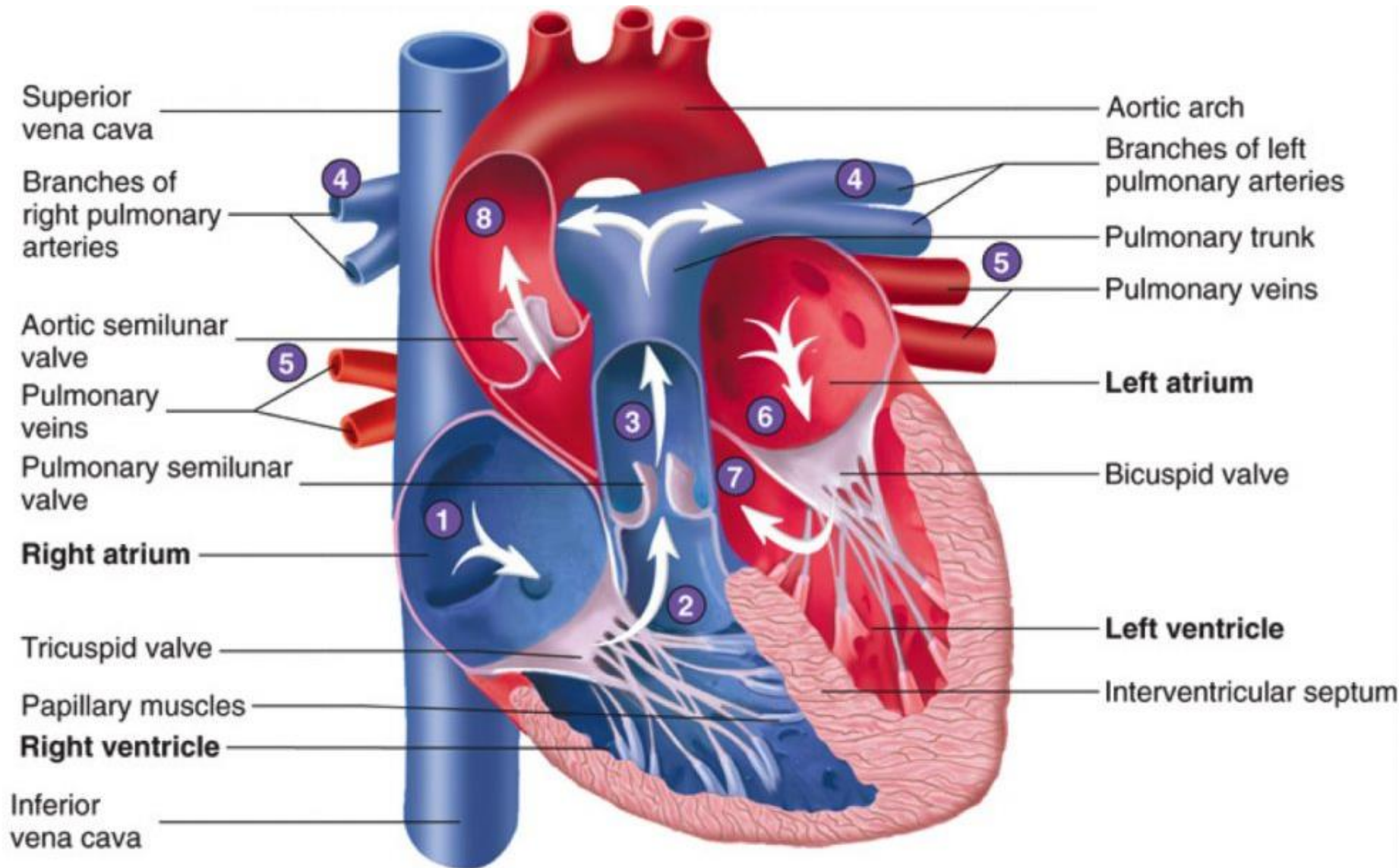
- Heart
- Blood vessels
- Double circulation

Structure of heart





Blood flow pathways



When are the sounds “LUBB” and “DUB” produced respectively during heart beat?

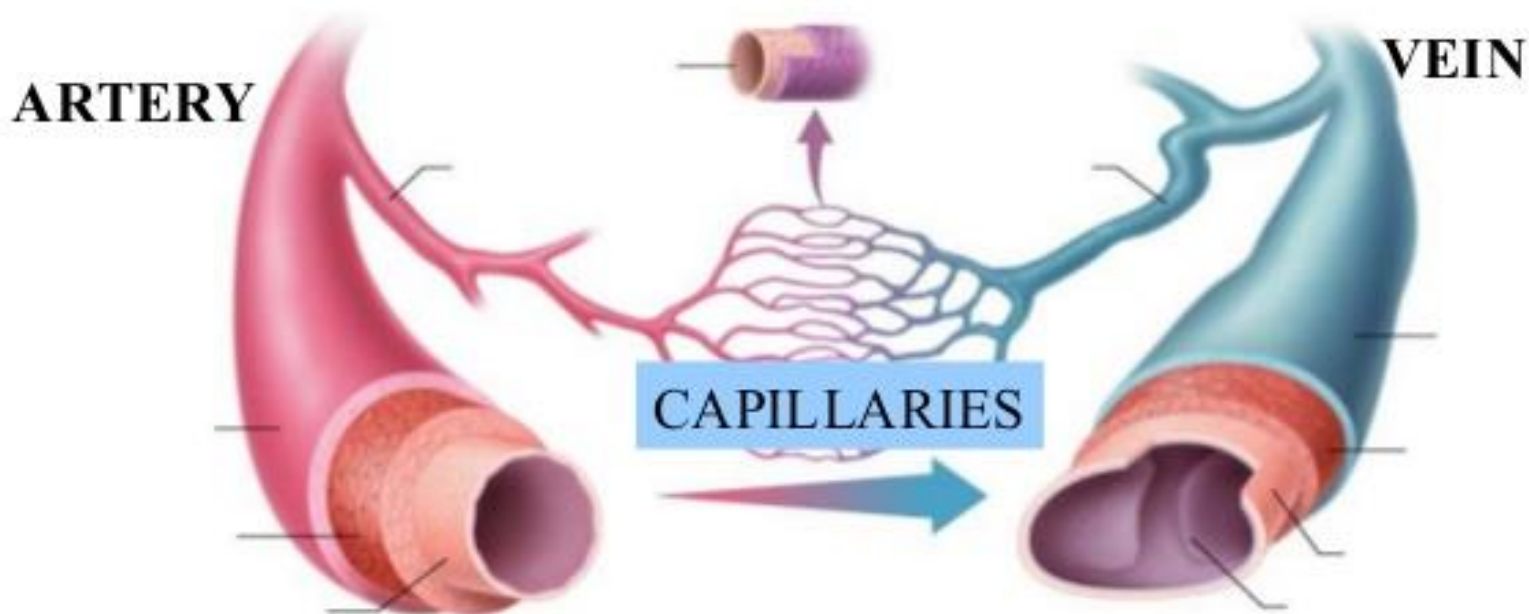
- The first sound “LUB” is produced when the atrio-ventricular (tricuspid and bicuspid) valves get closed sharply at the start of ventricular systole (contraction).
- The second sound “DUB” is produced when at the beginning of ventricular diastole (Relax), the semilunar valves at the roots of aorta and pulmonary artery get closed.

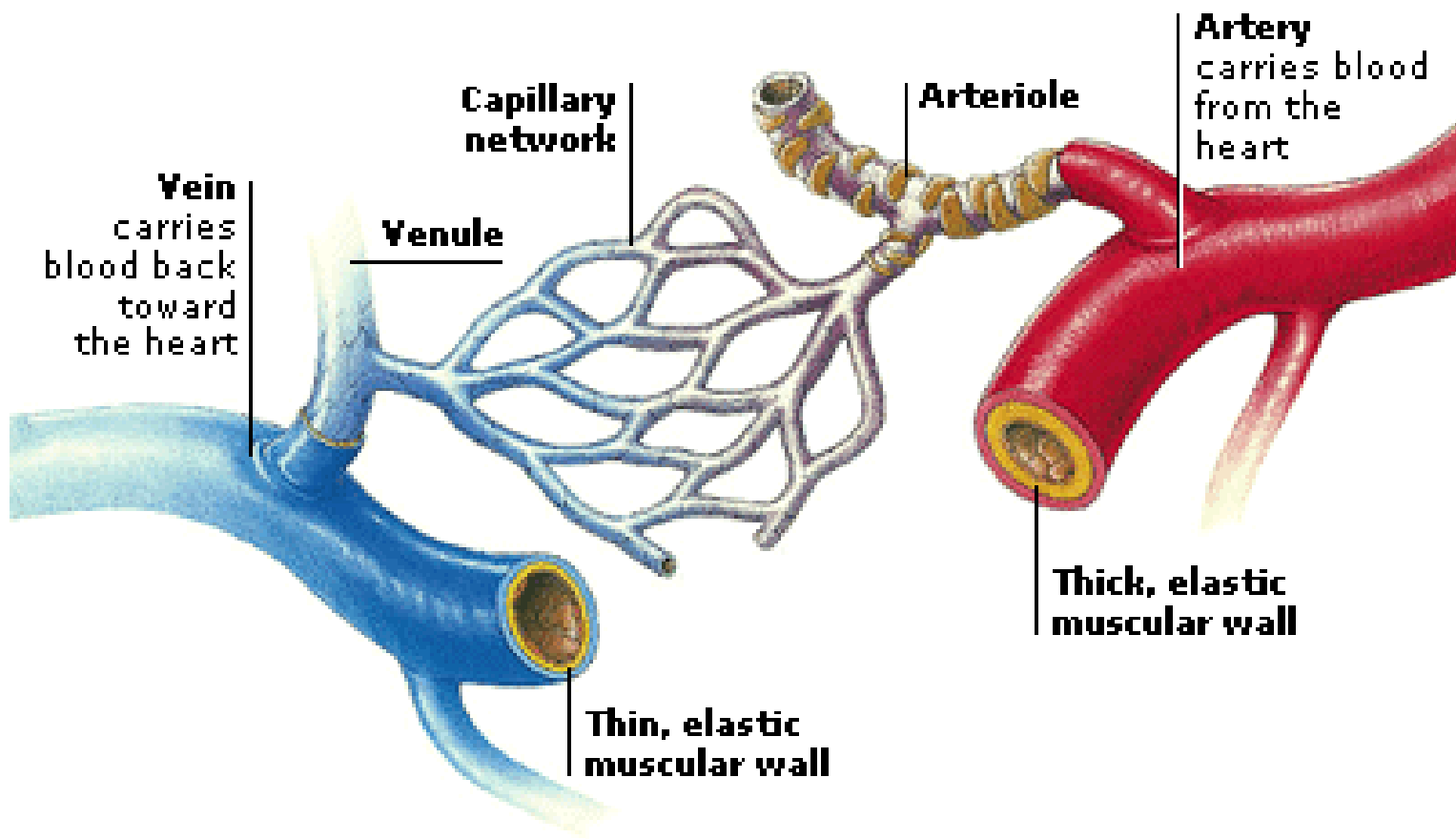
Blood moves through 3 different types of vessels:

Arteries – Carry oxygen rich blood away from the heart

Capillaries – Tiny vessels only one cell thick. Bring oxygen and nutrients to the cells. Remove waste products.

Veins – Carry blood back to the heart with wastes





Artery
carries blood
from the
heart

Arteriole

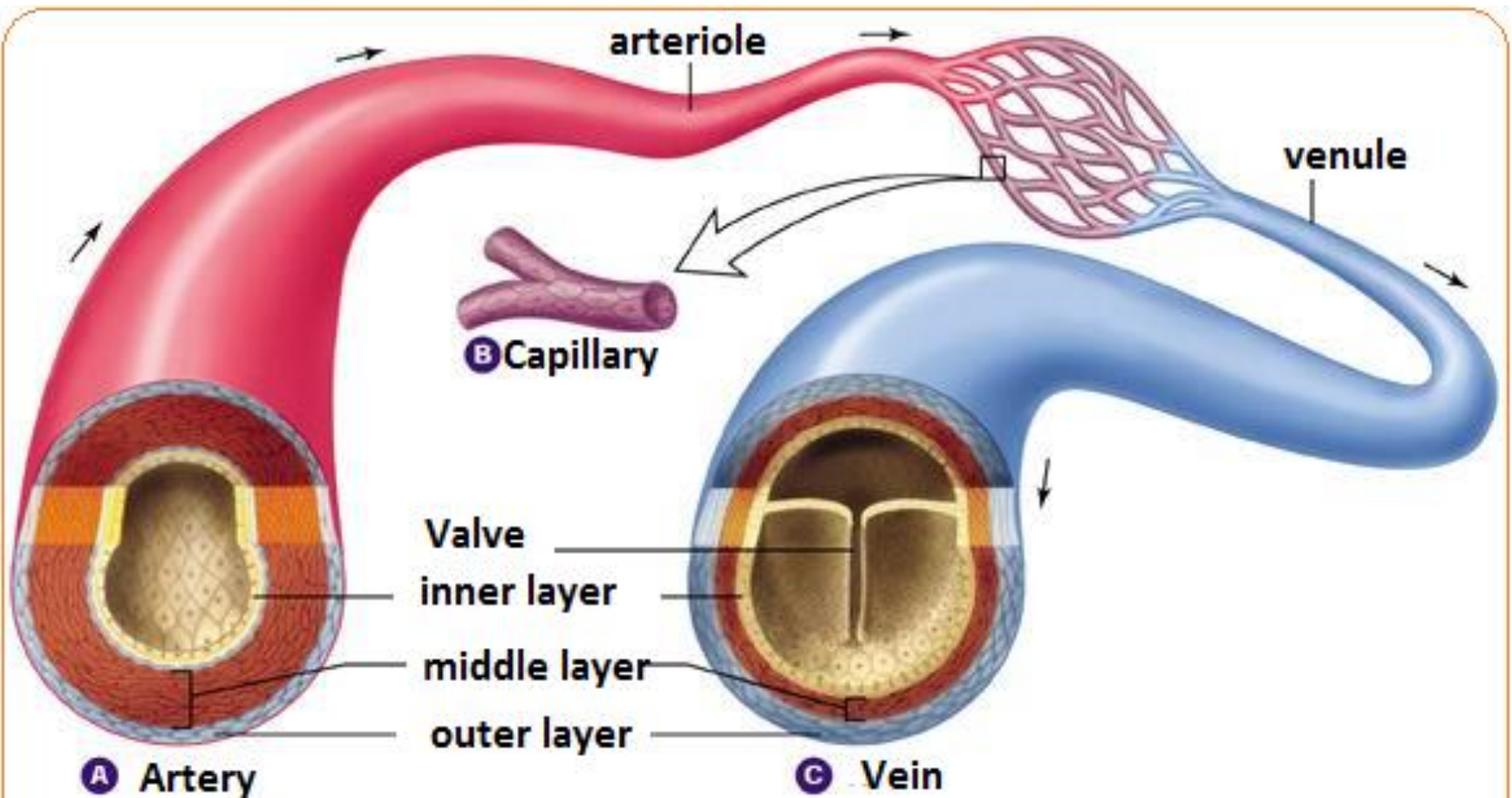
**Capillary
network**

Venule

Vein
carries
blood back
toward
the heart

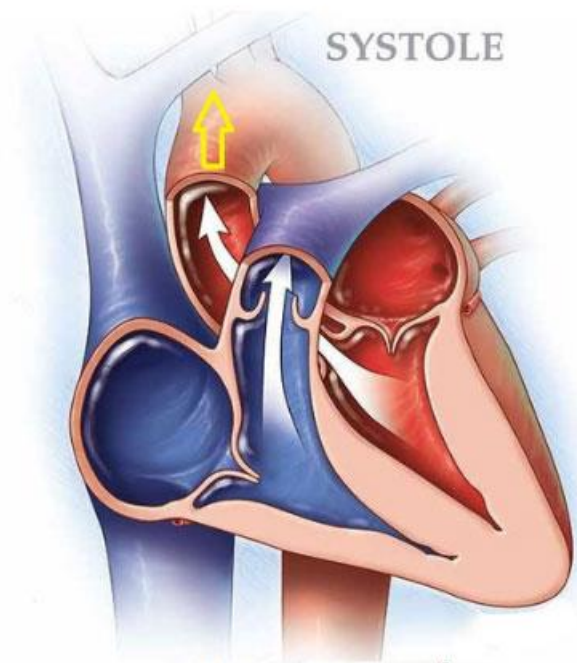
**Thick, elastic
muscular wall**

**Thin, elastic
muscular wall**



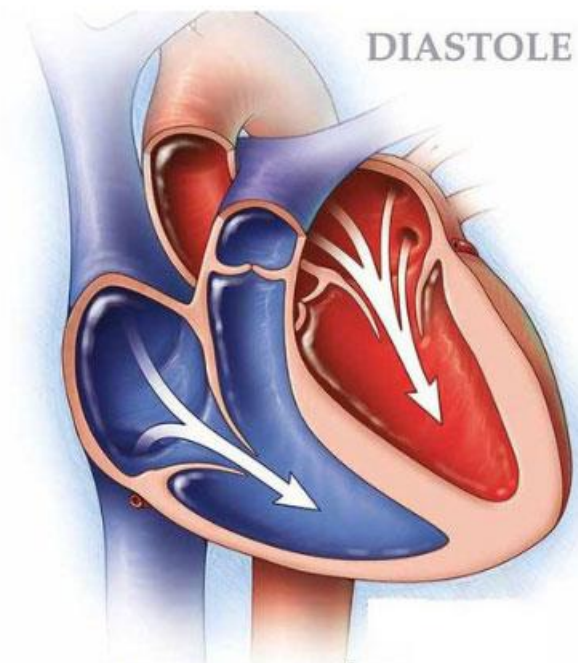
At any given moment, about 30% of the blood in your systemic circulation will be found in the arteries, 5% in the capillaries and 65% in the vein.

What Is **Systolic & Diastolic Pressure** & The Ideal Numbers



SYSTOLE

Heart muscles
Contract

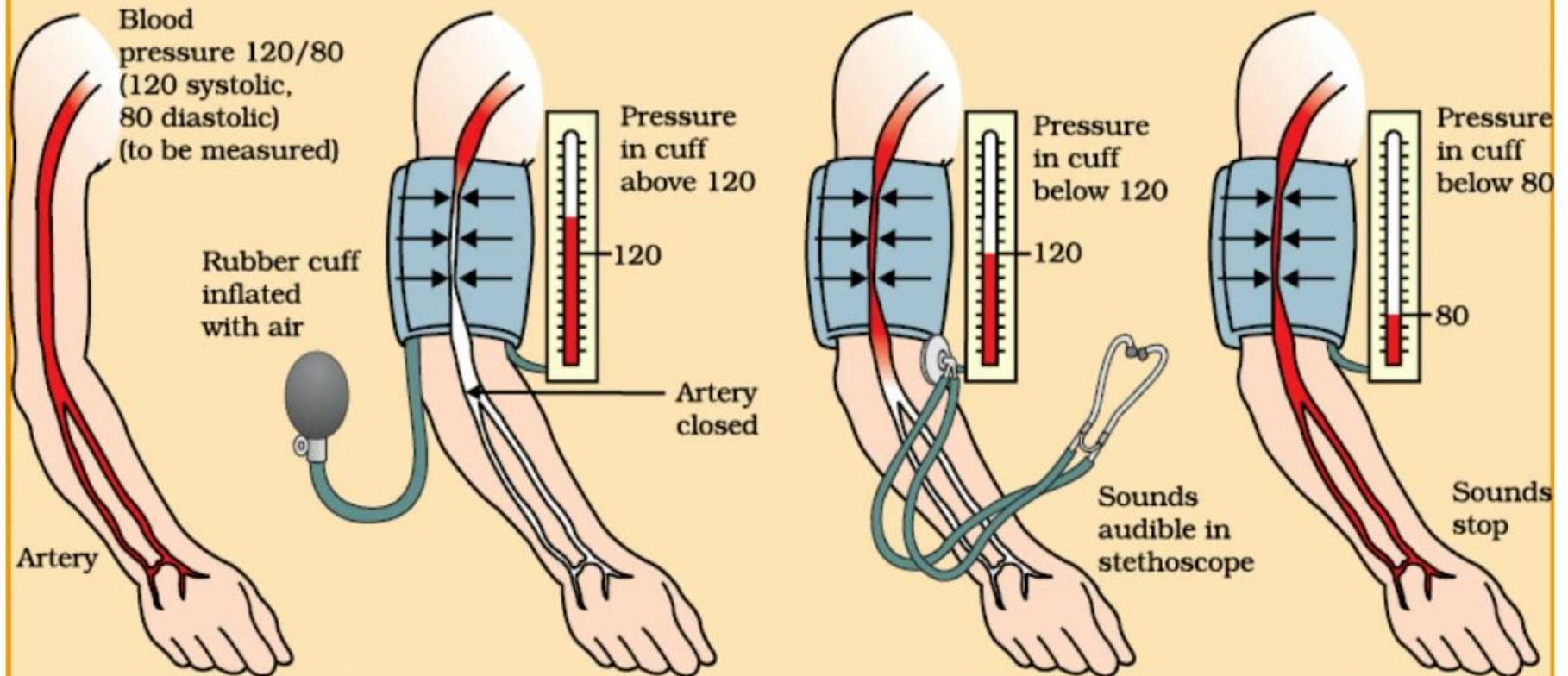


DIASTOLE

Heart muscles
Relax

Normal Blood Pressure

pressure is about 120 mm of Hg and diastolic pressure is 80 mm of Hg.



Blood pressure is measured with an instrument called sphygmomanometer. High blood

Difference between Arteries and Veins

CHARACTERS	ARTERIES	VEINS
Blood	The pure, oxygenated blood, rich in nutrients are carried by the Arteries.	The impure, deoxygenated blood, rich in waste materials is carried by the Veins.
Walls	Arteries walls are rigid, thicker and highly muscular.	Veins walls are thin and collapsible walls.
Body location	They are deeply situated within the body.	They are superficial, peripherally located closer to the skin.
Colour	Arteries are red in color.	Veins are blue in color.
The direction of Blood Flow	Arteries carries blood away from the heart to various parts of the body.	Veins carry blood from the various parts of the body towards the heart.
Flow pressure	The pressure is high as the blood flows by the pumping pressure of heart.	The pressure is low as the blood flows by the capillary action of the veins.
Oxygen level	Oxygen levels are quite high in the arterial blood.	Oxygen level is low comparatively.



CIRCULATORY SYSTEM IN HUMAN

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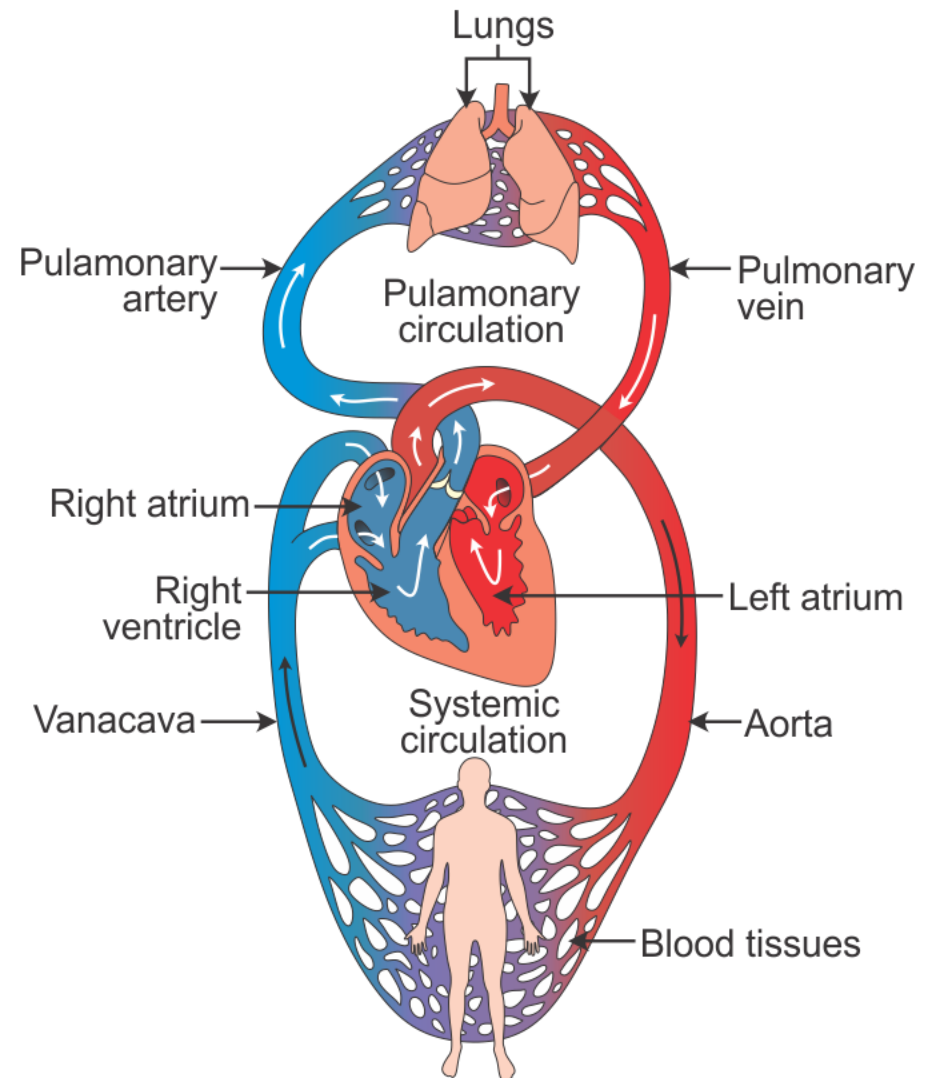
Double circulation is a process during which blood passes twice through the heart during one complete cycle. This type of circulation is found in birds, mammals.

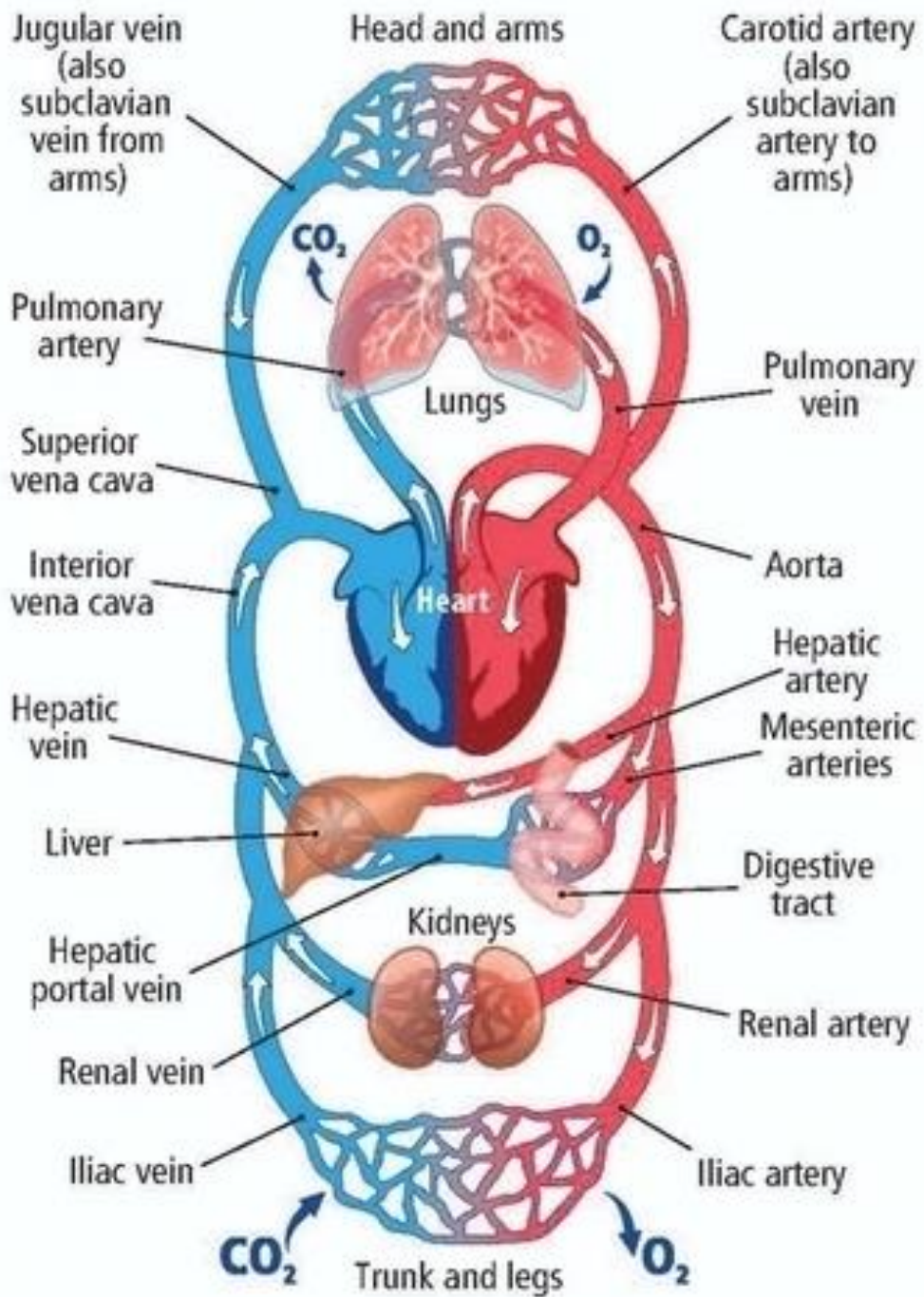
- 1) The blood from all body parts is brought to the right auricle which pumps it into the right ventricle. From right ventricle blood is pumped to the lungs (for pulmonary artery) for oxygenation.
- 2) The oxygenated blood from the lungs is brought to the left auricle which pumps it into left ventricle. From the left ventricle, oxygenated blood then distributed to all body parts through larger artery called Aorta. [this is second circulation]

Importance of double circulation :-

Double circulation not only allows highly efficient supply of oxygen to the body but it also helps in meeting the high energy needs. This high energy is required to maintain the constant body temperature.

Double Circulation

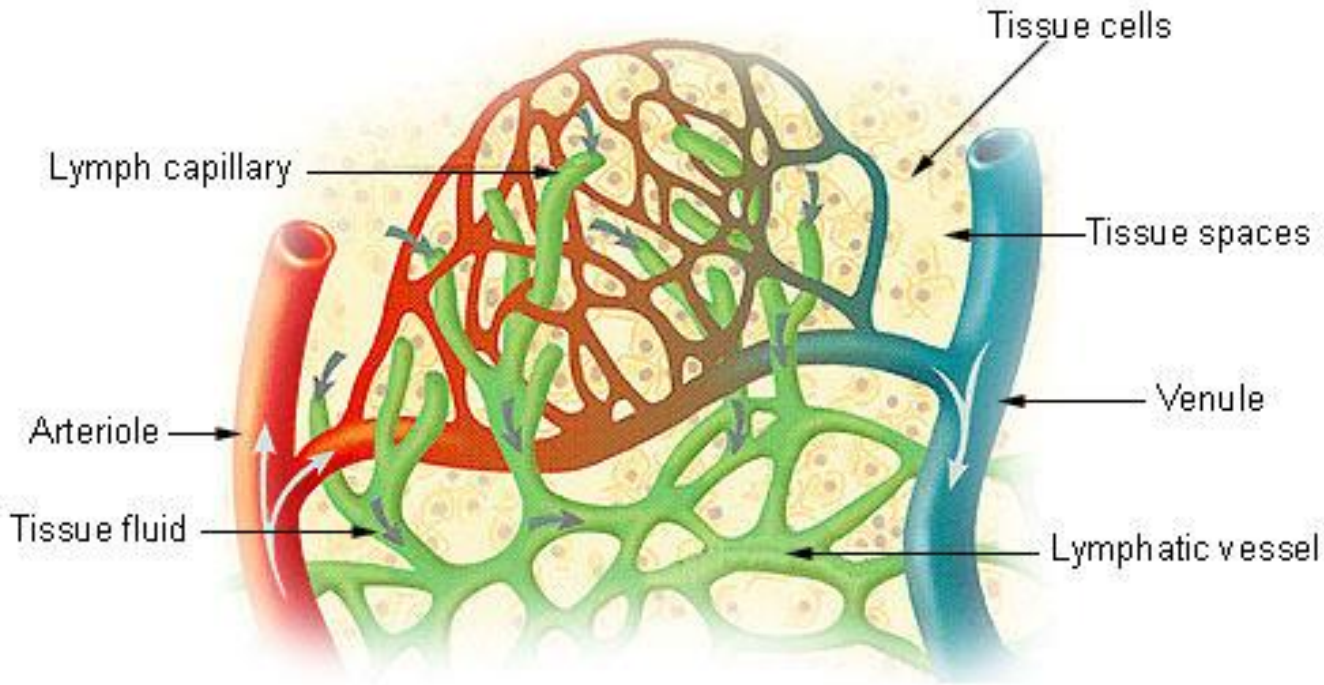




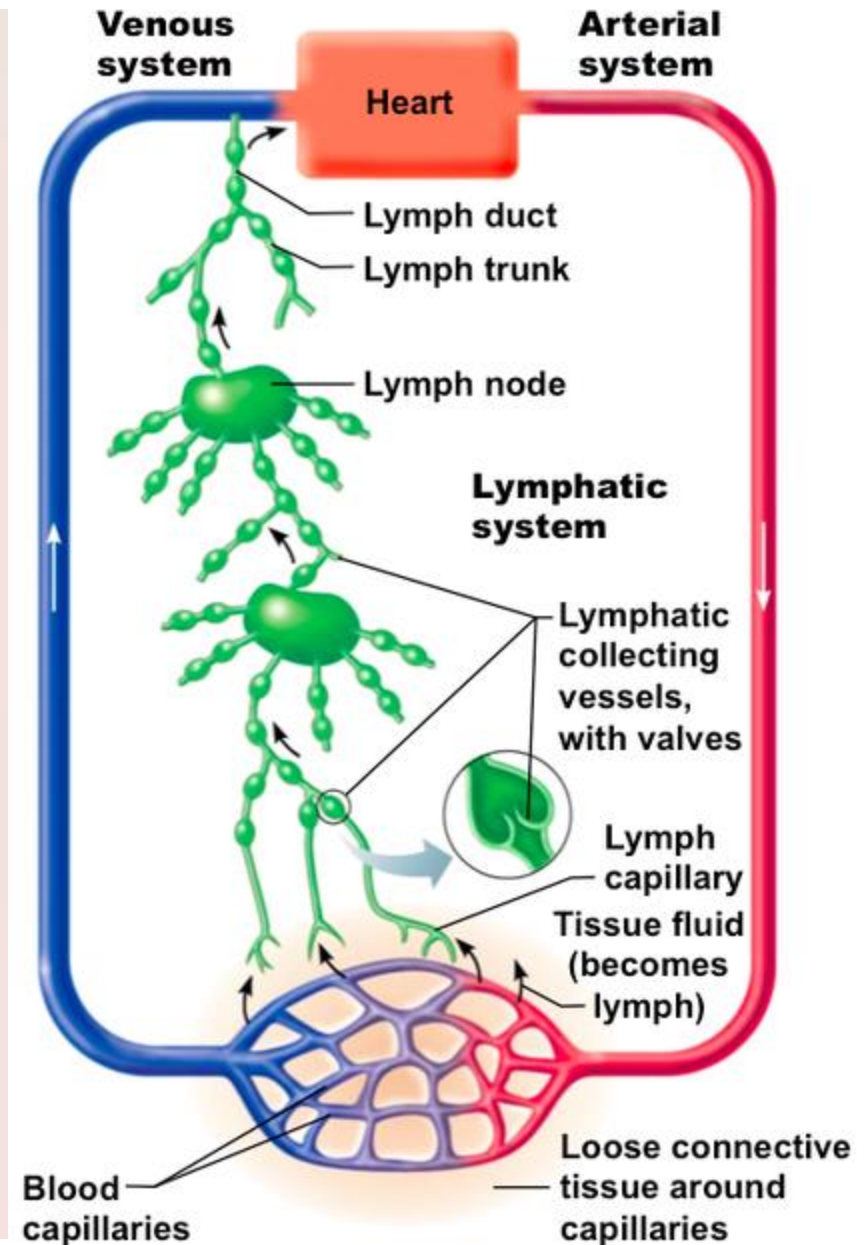
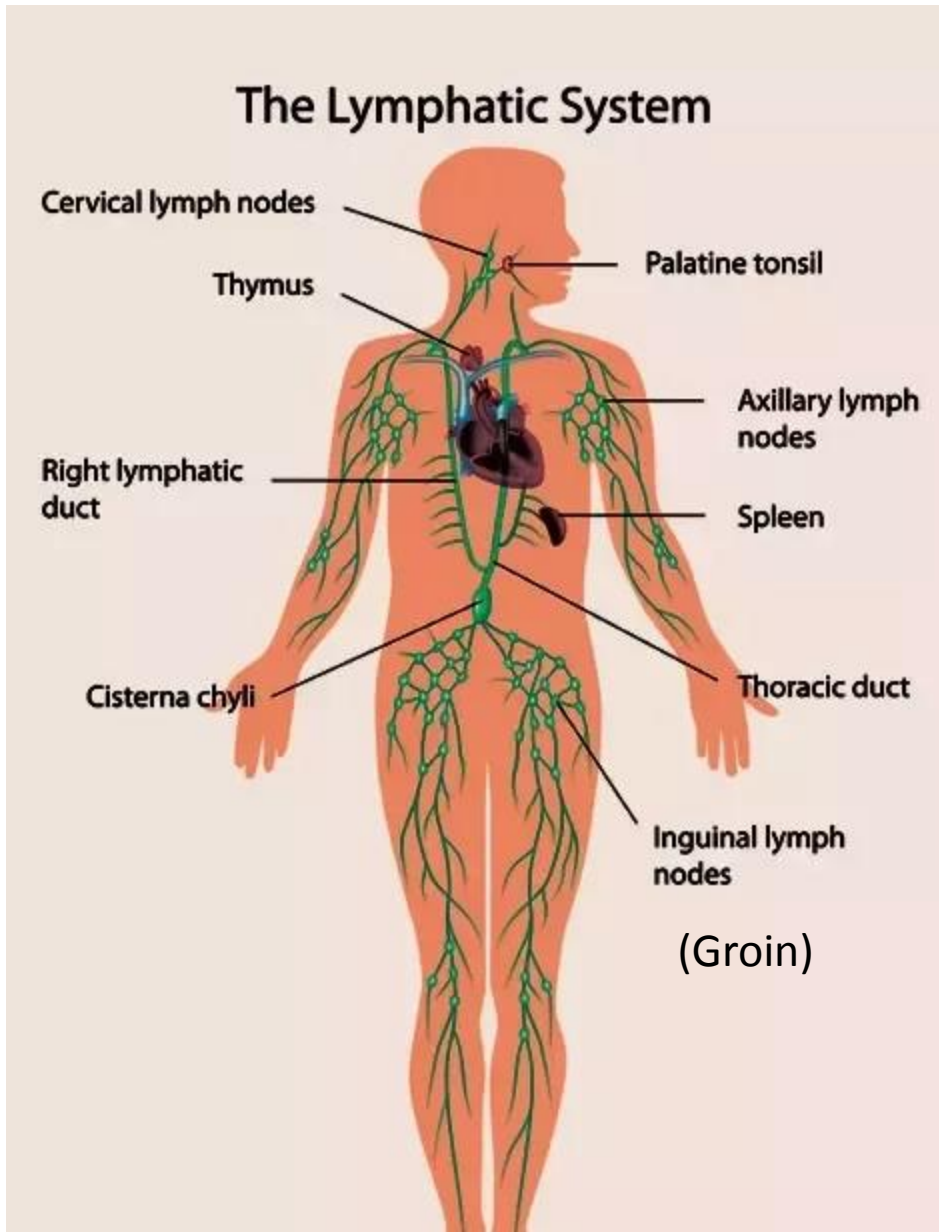
Differences between single and double circulation

Single circulation	Double circulation
<p>1) Blood flows through heart only once for completing one circulation. It is called single circulation. Eg : Fishes</p> <p>2) Pulmonary circulation is absent.</p> <p>3) Heart consists of two chambers.</p> <p>4) Single circulation is seen in fishes.</p>	<p>1) If the blood flows through heart two times for completion of one circulation. It is called double circulation. Eg : Mammals, birds.</p> <p>2) Pulmonary circulation is present.</p> <p>3) Heart consists of three or four chambers.</p> <p>4) Double circulation occurs in frogs, reptiles, birds and mammals.</p>

Lymph Capillaries in the Tissue Spaces



The lymphatic system, or lymphoid system, is an organ system in vertebrates that is part of the circulatory system and the immune system. It is made up of a large network of lymphatic vessels, lymphatic or lymphoid organs, and lymphoid tissues. The vessels carry a clear fluid called lymph towards the heart.



Cisterna chyli is a dilated sac at the lower end of the thoracic duct into which lymph from the intestinal trunk and two lumbar lymphatic trunks flows

Differences between the Blood and the Lymph

Lymph	Blood
It is a colourless fluid.	It is a reddish coloured fluid.
It is part of the lymphatic system	It is part of the circulatory system
It helps in body defence and is a part of the immune system.	It is associated with the circulation of oxygen and carbon dioxide, nutrients hormones, waste products etc.
It contains plasma and a lesser number of WBCs and platelets.	It contains plasma, RBCs, WBCs, and platelets.
Carries less amount of oxygen and digested food.	Carries more amount of oxygen and digested food.
Lymph plasma lacks proteins.	Blood plasma consists of proteins, calcium, and phosphorus.
Transports nutrients from the tissue cells to the blood, through lymphatic vessels.	Transports nutrients and oxygen from one organ to another.
The flow of lymph is slow.	The flow of blood in the blood vessels is fast.
Clots slowly due to the presence of less fibrinogen.	Clots quickly due to the presence of more amount of fibrinogen.
The movement of lymph is in a single direction.	The movement of Blood is in a circular motion.

Questions?

1. White blood cells engulf bacteria in a process called:

- (a) diapedesis**
- (b) phagocytosis**
- (c) active transport**
- (d) passive transport**

Solution:-

- (b) phagocytosis

2. The nearest organ to which the heart supplies oxygenated blood is

- (a) Lung**
- (b) Stomach**
- (c) Intestine**
- (d) Heart itself**

Solution:-

- (d) Heart itself

3. When a doctor is recording your pulse, he is pressing on your wrist exactly on a

- (a) vein**
- (b) capillary**
- (c) artery**
- (d) arteriole**

Solution:-

- (c) artery

Questions?

4. The blood vessels supplying blood to the kidney is

- (a) renal vein
- (b) renal artery
- (c) dorsal aorta
- (d) hepatic vein

Solution:-

- (b) renal artery

5. Angina Pectoris is due to

- (a) defective nutrition
- (b) chest pain due to inadequate supply of oxygen to the heart muscle
- (c) defective functioning of mitral valve
- (d) infection by a virus

Solution:-

- (b) chest pain due to inadequate supply of oxygen to the heart muscle

6. The chief function of lymph nodes is to

- (a) produce WBCs
- (b) produce hormones
- (c) destroy old RBCs
- (d) destroy pathogens

Solution:-

- (d) destroy pathogens

Questions?

1. Given below are certain structures, write their chief functional activity.

(a) Blood platelets.....

Solution:-

Blood platelets and blood coagulation

(b) Neutrophils

Solution:-

phagocytosis

(c) Erythrocytes

Solution:-

transportation of gases

(d) Lymphocytes

Solution:-

Produce antibodies

(e) Bone marrow

Solution:-

destruction of old and weak RBC's or production of RBCs and WBCs.

Questions?

2. Give reason, why a mature mammalian erythrocyte lacks nucleus and mitochondria?

Solution:-

Mammalian red blood cell when mature circulates in the blood system and are devoid of certain organelles. Loss of nucleus, makes the red cells biconcave, thus increasing their surface area volume ratio for absorbing more oxygen.

(a) Space in between increased.

(b) More RBCs can be accommodated in the same space.

Loss of mitochondria means that the red cells cannot use oxygen for themselves. Thus all the oxygen, absorbed from the lungs, is transported and delivered to the tissues unconsumed. Secondly, loss of mitochondria means full transport of glucose in blood plasma. Unused by the RBCs.

3. Write differences between
 - a) arteries and veins.
 - b) Tricuspid and bicuspid valve

4. When are the sounds “LUB” and “DUP” produced respectively during heart beat?

5. What is meant by the term ‘double circulation’ of blood in mammals?

6. Name any one important component of the blood which remains inside the capillaries and fails to move out into the spaces.

Solution:- The important component of the blood which remains inside the capillaries and fails to move out into the spaces is **Red Blood Cells**.

7. The table below is designed to indicate the transport of certain substances in our body. Fill in the blanks with suitable answers.

Substance	From	To
1.	Lungs	Whole body
2. Carbon dioxide
3. Urea
4. Digested carbohydrates	Intestine
5.	Target organs

Solution:-

Substance	From	To
1. Oxygen	Lungs	Whole body
2. Carbon dioxide	Whole body	Lungs
3. Urea	Whole body	Kidneys
4. Digested carbohydrates	Intestine	Whole body
5. Hormones	Endocrine glands	Target organs

Explain why?

(a) The left ventricle has thicker walls than the right ventricle.

Solution:-

The left ventricle has thicker walls than the right ventricle because, the left ventricle pumps blood up to the farthest points in the body, such as, up to the toes in the feet or up to the brain against gravity. But right ventricle pumps blood only up to the lungs for oxygenation.

(b) The walls of the right ventricle are thicker than those of the right auricle.

Solution:-

The walls of the right ventricle are thicker than those of the right auricle because, the right ventricle pumps blood up to the lungs for oxygenation. But auricles major function is to receive blood from the body and pump it into the very next ventricles.

(c) Only the veins and not the arteries are provided with valves.

Solution:-

Only the veins and not the arteries are provided with valves because, Veins carry blood away from an organ and towards the heart and have valves in their inner lining to prevent backward flow of blood. But arteries carry blood away from the heart and into an organ have no valves in their inner lining.

(d) Atrial wall is less muscular than the ventricular wall.

Solution:-

Atrial wall is less muscular than the ventricular wall because, the ventricle pumps blood up to the lungs for oxygenation and ventricle pumps blood up to the farthest points in the body, such as, up to the toes in the feet or up to the brain against gravity. But atrial major function is to receive blood from the body and pump it into the very next ventricles.