Chapter -15

Body fluids and circulation

Q Why need of circulation?

Ans→ Our difference body part are present in different location they require oxygen & nutrients, blood transport O_2 & nutrien to oxygen, tissue or cell.

Introduction

↳ The living cells must be provided with nutrients, O_2 and other essential substances.

↳ Simple organisms like sponges and coelenterates have developed a system that circulates water from the surroundings through their body cavities.

↳ Higher and complex organisms, these function are carried out by certain fluids in their bodies.

↳ The higher groups use blood as one of the most common body fluids.

↳ Human beings, blood is used for the transportation of the above-mentioned sustances.

↳ The transport of some specific substances is brought about by the lymph (tissue fluid) which is another example of body fluid.

↳ Blood is fluid connective tissue.

Blood

↳ Comprising of a fluid matrix, plasma and formed elements, blood can be defined as the special connective tissue which is the softest tissue in the human body.

↳ The pH of blood is more in arteries when compared to the veins.

↳ 7.4, it is slightly alkaline.

↳ The blood will carry less amount of oxygen if it becomes acidic in nature.

↳ Carbonic anhydrase would be inhibited.

↳ The pH of blood is maintained by the balanced ratio of carbonic acid and sodium bicarbonate.

Plasma

↳ Straw coloured, 55 %. of blood.

↳ 90-92 %. of water and 6-8 %. proteins.

↳ Three major proteins produced in the liver
- Fibrinogen
- globulins
- albumins

↳ Albumins → osmotic balance

↳ Globulins → defence

↳ Fibrinogens → coagulation or clotting of the blood.

↳ In plasma, one can find little quantities of minerals like Na^+, Ca^{++}, Mg^{++}, HCO_3^-, Cl^- etc.

↳ Also, as glucose, amino acids, lipids etc.. are always in transit in the human body, they are also present in plasma.

↳ 100 mg / 100 ml of blood or 1 gm / litre or 0.1%. is considered as the normal glucose level.

↳ Although in an inactive form, the factors that are responsible for the clotting of blood are also present in plasma.

↳ Serum is nothing but the plasma without the clotting factors.

plasma − clotting factor = serum

Formed elements

↳ Formed elements of blood are erythrocytes, leucocytes and platelets.

↳ Formed elements constitute about 45%. of blood

Blood = Plasma + RBCs + WBCs + Platelets

↳ **RBCs** :- In blood, the most abundant cells are the erythrocytes or red blood cells.

- In a healthy adult man, 5 million to 5.5 million of RBCs per mm^3 of blood are seen on an average.
- Formed in liver in the foetus, they are synthesized in the red bone marrow in adults.
- In RBCs, red coloured complex protein haemoglobin is present which contains iron, hence the name and colour of these cells.

↳ Haemoglobin that the transportation of respiratory gases takes place.

↳ Mammalian RBCs - biconcave in shape
↳ One cannot find mitochondria, Golgi body, ER and lysosome as they are absent in RBCs.
↳ In most of the mammals, RBCs are enucleated (nucleus is absent).
↳ As RBCs are destoryed in spleen after completing their life span, it is also known as the graveyard of the RBCs.
↳ The average life span of RBCs is 120 days
↳ The process of formation of blood cells is known as the haemopoiesis or haematopoiesis.
↳ The formation of RBCs or erythrocytes is termed as erythropoiesis.

embryo → Yolk sac
embryo → Mesoderm ✓

Child → Liver ✓
Child → Spleen (filter of body)

Haemoglobin

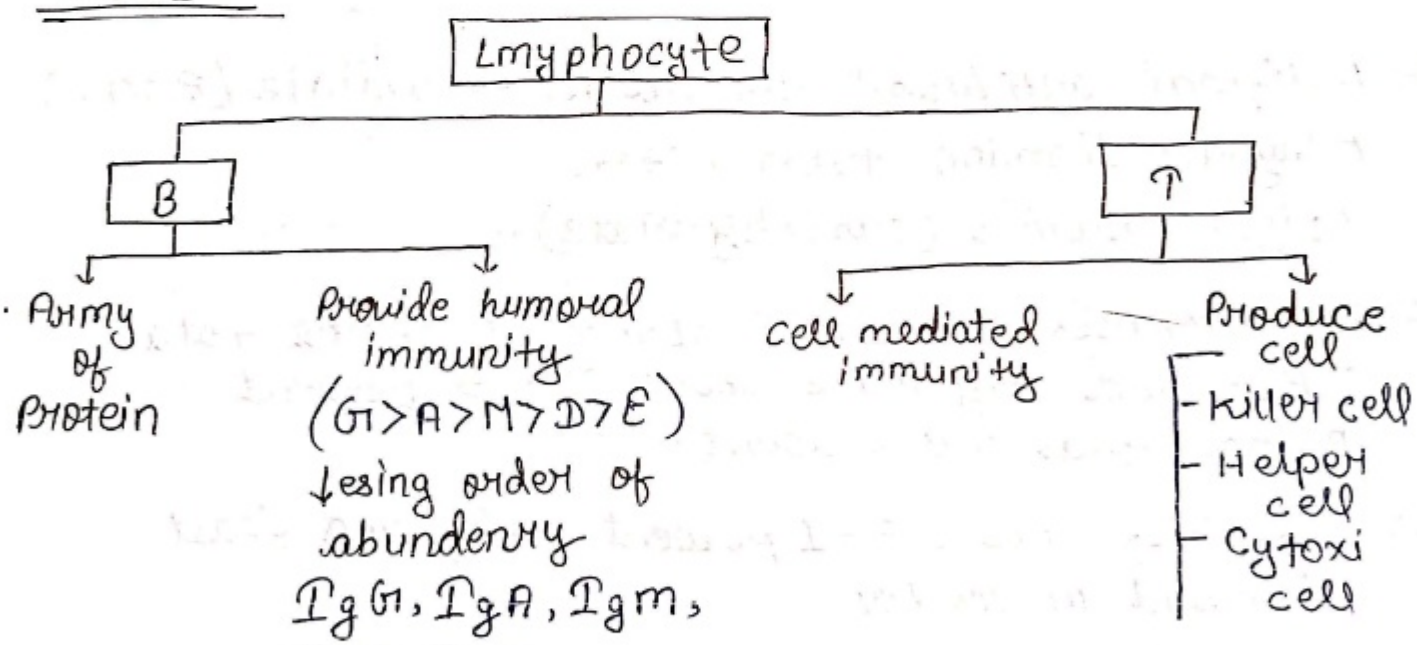
↳ Haemoglobin is a complex chromoprotein consisting of a protein called globin and non-protein iron containing part called heme.

↳ Iron is attached to globin part by co-ordinate bond.

↳ Haemoglobin molecule has two α-chains (with 141 amino acids each) and two β-chains (with 146 amino acids each)

↳ A healthy individual has 12-16 gms of haemoglobin in every 100 ml of blood.

WBCs :-



↳ Colourless

↳ They are also known as leucocytes

↳ The WBCs are nucleated and the count of WBCs seen in an average healthy individual is 6000 - 8000 mm^3 of blood.

↳ Two major kind
- Granulocytes
- Agranulocytes

↳ Granulocytes
- Neutrophils
- Eosinophils
- Basophils

↳ Agranulocytes
- Lymphocytes
- Monocytes

↳ Artifical anti blood congulant → oxilate (EDTA)
Ethylene diamine tetra acitate.
Polysaccharide (carbohydrate).

↳ Neutrophils are most abundant of the total WBCs and they make about 60-65 percent of the total WBCs count.

↳ Basophils are 0.5 - 1 percent only and least abundant in number.

↳ Foreign organisms that come in the body are destroyed by the neutrophils and monocytes (6-8 %.) which are the phagocytic cells.

↳ chemicals such as histamine, serotonin, heparin, etc. secreted by basophils which take active part in the inflammation reactions.

↳ About 2-3 % of the WBCs is constituted by eosinophils.

↳ Eosinophils are associated with allergic reactions and also resist infections.

↳ Lymphocytes (20-25 %) are of two major types :- 'B' and 'T' forms.

↳ Both B and T-Lymphocytes are immune responses of the body.

- Basophils ÷ Histamine produce from histidine amino acid.

  function :- Acid secretion, Allergic reaction, Alertness, Vasodilator.

- Serotonin :- vasocontractor
- Eosinophils :- Mood, sleep, digestion, pain control.

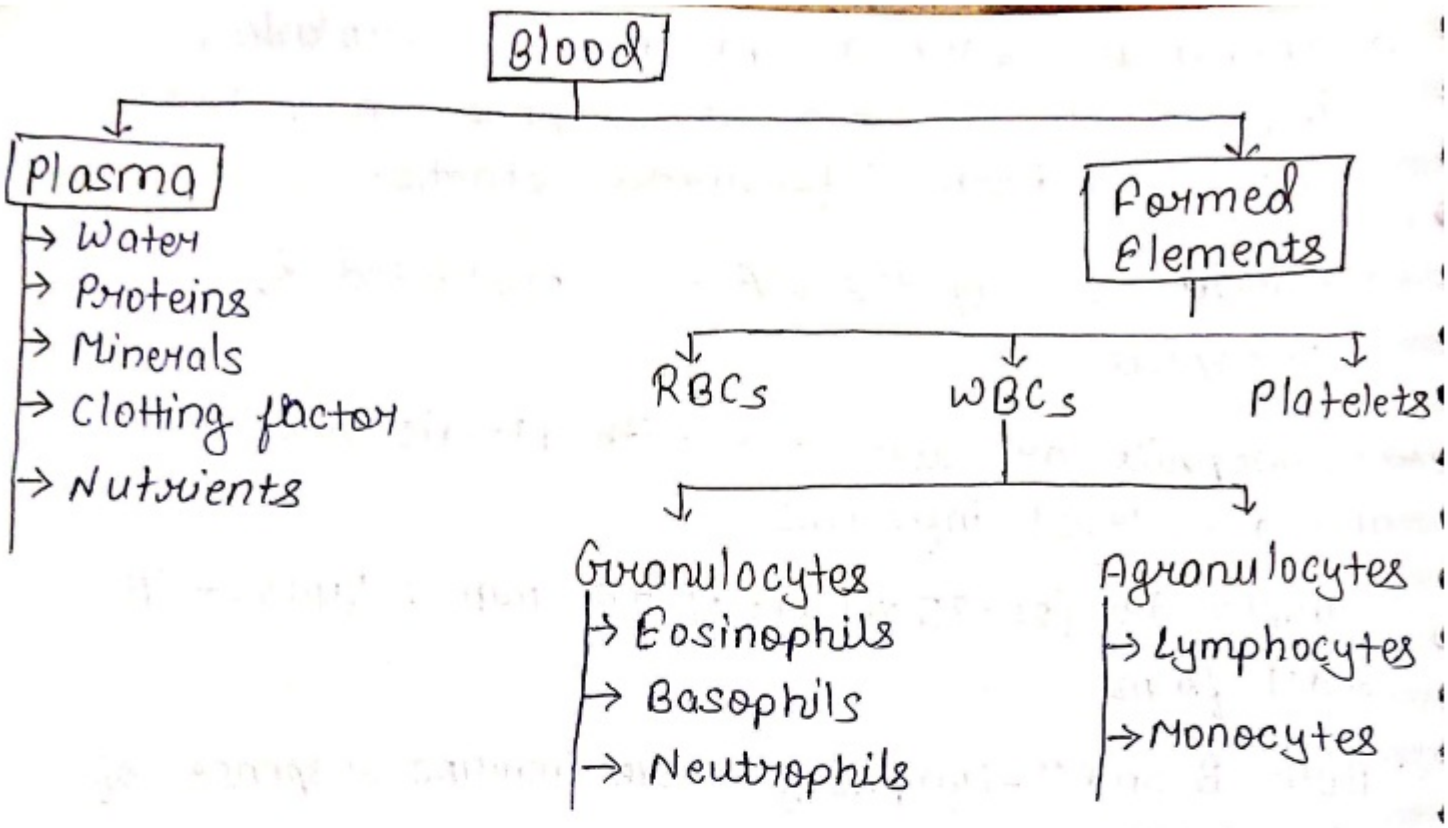
Platelets :-

↳ 1,50,000 - 3,50,000 platelets per mm^3.

↳ Platelets are the cell fragments which also called thrombocytes.

↳ Platelets are produced by special cells in the bone marrow known as megakaryocytes.

↳ A decrease in the number of platelets leads to clotting disorder which will cause excessive loss of blood from the body.


Blood
Plasma
→ Water
→ Proteins
→ Minerals
→ Clotting factor
→ Nutrients
Formed Elements
RBCs
WBCs
Platelets
Granulocytes
→ Eosinophils
→ Basophils
→ Neutrophils
Agranulocytes
→ Lymphocytes
→ Monocytes

Blood Groups

↳ Most accepted ones the ABO and Rh.

↳ Antigens that are present on the surface of the RBCs help in the identification of the different blood groups.

ABO Grouping

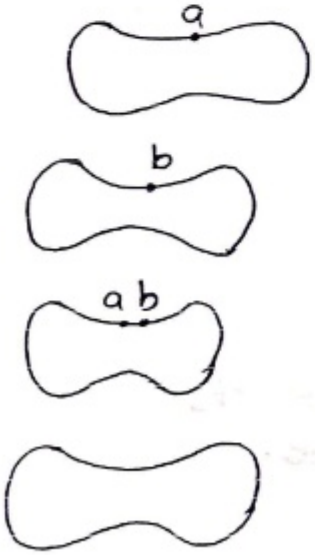
↳ Antigens are chemicals present on the surface of the RBCs and can produce immune response.

↳ The presence and absence of the two surface antigens (A & B) determine the ABO grouping.

↳ The plasma of different persons have two natural antibodies which are proteins that are produced in response to antigens.

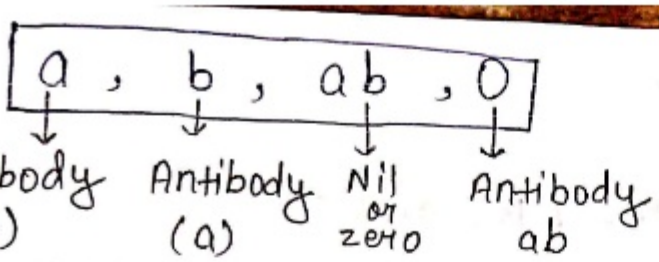
↳ While their plasma will contain anti-B antibody, a person who has blood group A will have A-antigen on the surface of his RBCs.

→ Discovered by Carl Land Steiner.

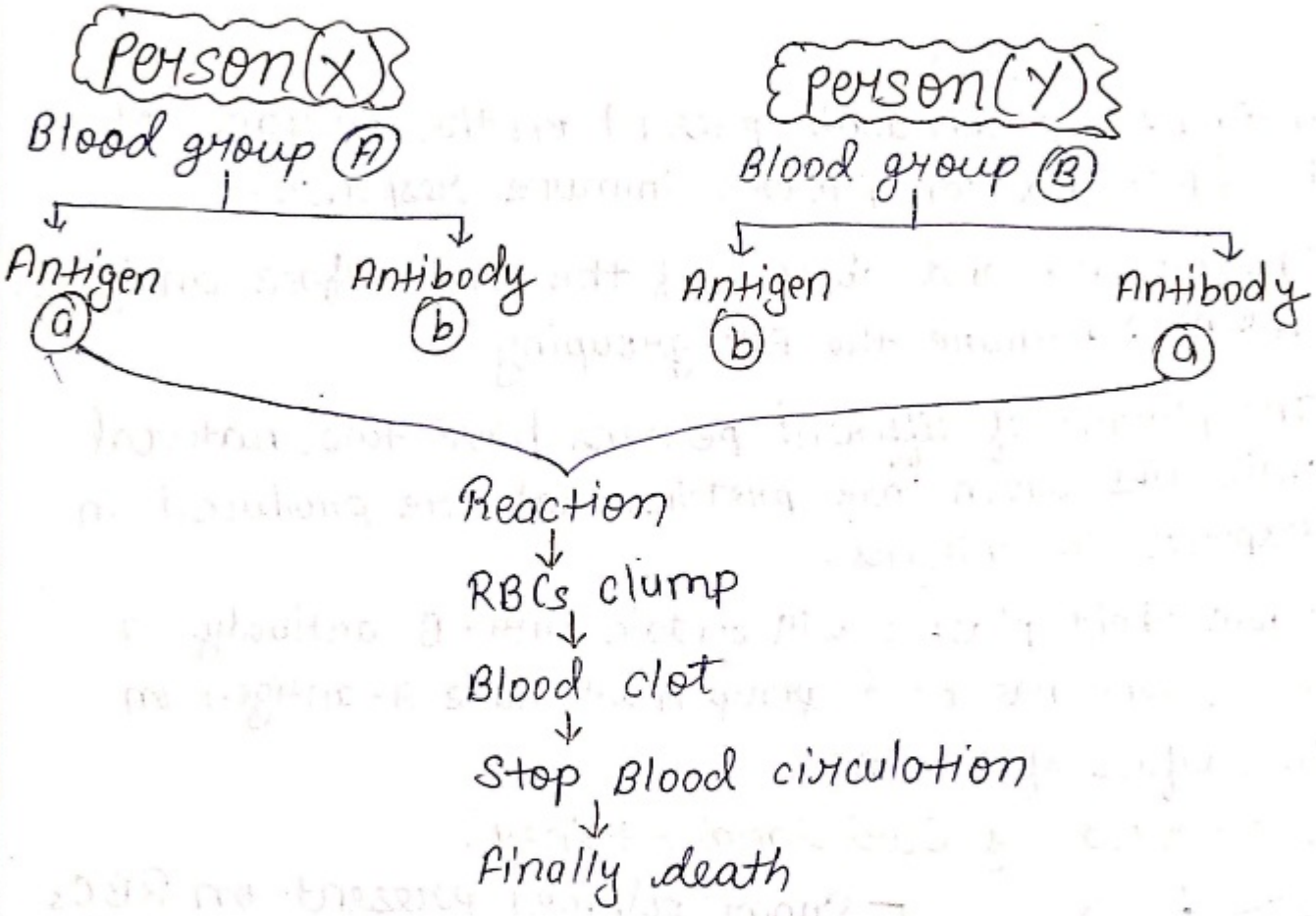


→ or Agglutin

- Sugar polymer present on RBCs surface / membrane
- a → Blood group A
- b → Blood group B
- ab → Blood group AB
- O → Blood group O {no antigen}



these antigen or sugar polymer on RBCs membrane decide the blood group.



Donor	Recipient
B antigen (b)	A antibody (b)
AB antigen (ab)	A antibody (b)
AB antigen (ab)	B antibody (a)

All these case the person will die.

A antigen (a) —— AB antigen (ab)

B antigen (b) —— AB antigen (ab)

These case person will not die.

phenotype = 4 } of Blood group
Genotype = 6 }

O antigen (ab) —— AB antigen (ab)

O antigen (ab) —— A antigen (a)

O antigen (ab) —— B antigen (b)

O antigen (ab) —— O antigen (ab)

In these case person death will not happens.

B.G ⇒ A ⇒ $I^A I^A$ → homozygous
⇒ $I^A I^O$ → heterozygous
} symbol

~~Rh Grouping~~

Blood group	Antigens on RBCs	Antibodies in plasma	Donor's group
A	A	anti-B or b	A, O
B	B	anti-A or a	B, O
AB	A and B	nil	AB; A, B, O
O	nil	anti-A, B	O

Rh Grouping

↳ Quite similar to the one present in Rhesus monkey (Macaca rhesus) and also observed on the surface of RBCs of majority (nearly 80%) of humans, there is one more antigen named as Rh antigen.

↳ (Rh +ve) and the individuals in which this is absent are known as (Rh -ve).

↳ Therefore, before transfusions, Rh group should also be matched.

↳ The Rh -ve of blood of a pregnant mother with (Rh -ve) blood of the foetus has been recorded as a classical case of Rh incompatibility (mismatching).

↳ During the first pregnancy the two bloods: one of the mother and second of the foetus are well separated by the placenta and hence the Rh antigens of the foetus do not get exposed to the Rh -ve blood of the mother.

↳ However, there is a chance that the maternal might be exposed to small amounts of the (Rh +ve) blood from the foetus during the delivery of the first child.

↳ Resulting from this, the blood of the mother starts preparing antibodies against Rh antigen.

→ Universal donor is O^-

→ Universal receptor is AB^+

↳ Now when and if the mother is pregnant with a second child and the foetus is Rh +ve, the Rh antibodies from the mother (Rh-ve) can leak into the blood of the foetus and destruct the RBCs of the foetus.

↳ This could be fatal to the child or cause anaemia and ~~jaundice~~ jaundice to the ~~bad~~ baby.

↳ The destruction of RBCs of foetus, this condition is known as erythroblastosis foetalis or HDN or haemolytic diseases of the newborn. Erythroblastosis foetalis can be avoided by administering anti-Rh antibodies to the mother immediately after the delivery of the first child.

Coagulation of blood

↳ One must have seen that the blood does not continue to flow and is stopped after some time on its own after one has cut finger or hut himself / herself.

↳ Coagulation or clotting of blood is the response from the blood to prevent unrestrained loss of blood from the body that takes place due to injury or trauma.

↳ As some time passes, one may see a dark reddish brown scum (clot) at the place of the injury or wound.

↳ The dead and destroyed formed elements of blood are trapped by a network of threads called fibrins that forms this clot or coagulum.

↳ The conversion of inactive fibrinogens in the plasma by the enzyme thrombin results in the formation of fibrins.

↳ The inactive substance called prothrombin in plasma is converted into thrombin.

↳ An enzyme complex called thrombokinase is responsible for the above conversion.

↳ When the series of linked enzymic reactions takes place in a {cascade process}, the formation of thromokinase occurs.

↳ Some inactive factors that are already present in the plasma are also required for cascade process.

↳ A few other factors that are released by the tissues at the site of the injury can also initiate coagulation.

↳ Certain factors which activate the mechanism of coagulation, are released by platelets in the blood due to stimulation of an injury or trauma.

Cascade Process

Thrombokinase / Thromboplastin
injured tissue & platelets

↓ Produced by liver vitamin (K)

Prothrombin (inactive) (enzyme formation) → Thrombin (active)

↓ vitamin (K)

Fibrin ← Fibrinogen (inactive) (Blood protein)

↓

Fibrin + dead cell or Blood platelets, Blood cell plasma → clot

Circulatory Pattern

Two kinds of circulatory pattern
- open
- closed

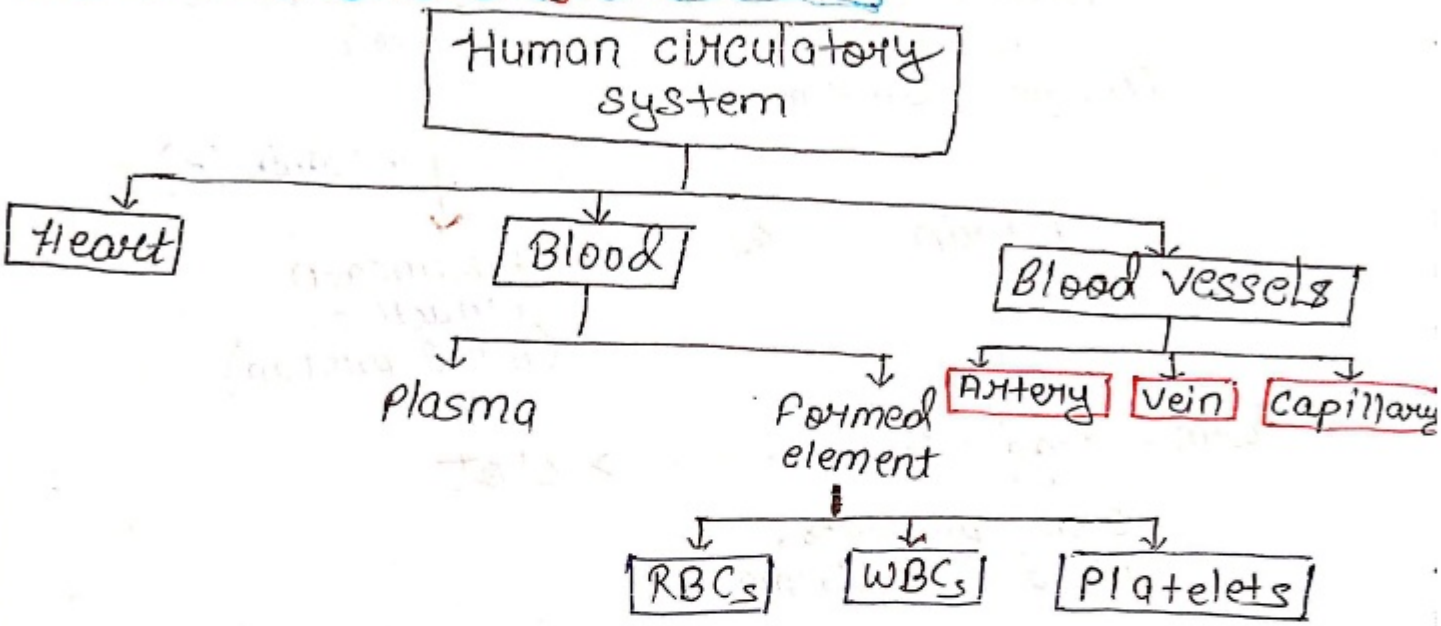
Open circulatory system

→ Blood is pumped by the heart and passes through large vessels into open spaces or body cavities called sinuses, this is known as open circulatory system and is seen in arthropods and molluscs. eg:-(HEMA).

closed circulatory system

↳ The blood pumped by the heart is always circulated through a close network of blood vessels. are seen in annelids and chordates.

Human Circulatory System



→ Human circulatory system consists of a muscular chambered heart, a network of closed branching blood vessels and blood, the fluid which is circulated.

→ Human circulatory system is also termed as the blood vascular system.

→ A mesodermally derived organ, the heart is situated in the thoracic cavity, in between the two lungs, slightly tilted to the left.

↳ # The reason behind heart being heard on the left side is that the ventricles of the heart are located on the left side.

↳ size of the heart - clenched fist

Pericardium

↳ Double-walled membranous bag is Pericardium.
↳ It protects the heart.
↳ It contains the pericardial fluid.
↳ The heart is divided into four chambers which are : two smaller upper chambers known as atria and two relatively lower large chamber is known as ventricles.

Inter atrial Septum

↳ A thin, muscular wall separates the left and right atria.

Inter-ventricular Septum

↳ It is a thick fibrous tissue separates the atrium and ventricle of the same side.

Tricuspid valve

↳ Opening between the right atrium and the right ventricle is guarded by a tricuspid valve.
↳ Formed by three muscular flaps or cusps.

Bicuspid or mitral valve

↳ Guards the opening between the left atrium and the left ventricle.

Semilunar valves

↳ where the right and the left ventricles open into the pulmonary artery and the aorta respectively.

↳ Semilunar valve also called ventricular valve or Pulmonary valve or Aortic valve respectively.

Note:- Tricuspid & bicuspid valve also called ventricular valve.

↳ The flow of blood takes place from the atria to the ventricles, and from the ventricles to the pulmonary artery or aorta is unidirectional which means only in one direction because of the presence of the valves.

↳ Heart is made up of cardiac muscles entirely.

↳ Walls of ventricles are thicker compared to the atria.

↳ Chordae tendinae are tendons of papillary muscles which are attached to the flaps of the biscuspid and tricuspid valves.

↳ Chordae tendinae prevents the bicuspid and tricuspid valves from collapsing back into the atria during ventricular contractions.

↳ The nodal tissue which is a specialised cardiac musculature is also distributed in the heart.

Sino-atrial nodes (SAN)

↳ A patch of this tissue is present in the right upper corner of the right atrium termed as the (SAN).

Atrio-ventricular node (AVN)

↳ Another mass of this tissue that is seen in the lower left corner of the right atrium close to the atrio-ventricular septum.

Atrio-ventricular bundle (AV bundle).

↳ A bundle of nodal fibres that is seen to continue from the AVN which passes through the atrio-ventricular septa to appear on the top of the inter-ventricular septum.

Purkinje fibres

↳ AV bundle divides into right and left bundle. Right and left bundles give rise to minute fibres throughout the ventricular.

↳ Nodal musculature is auto-excitable. i.e. it can generate action potential without the presence of any external stimuli.

↳ The heart beats 70-75 times/minutes and 72 beats per minute on an average.

↳ SA node is termed as the heart of the heart.

(current flow dirn)

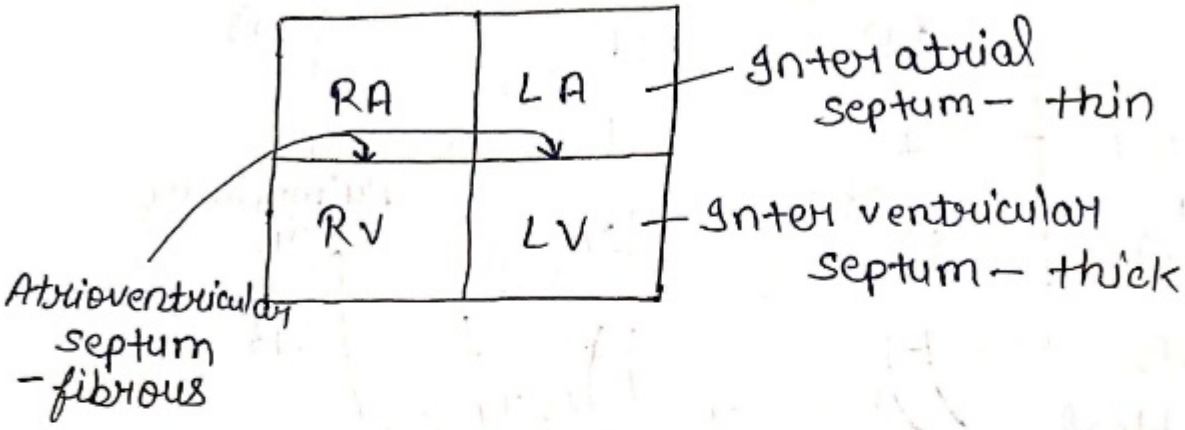
Nodal tissue

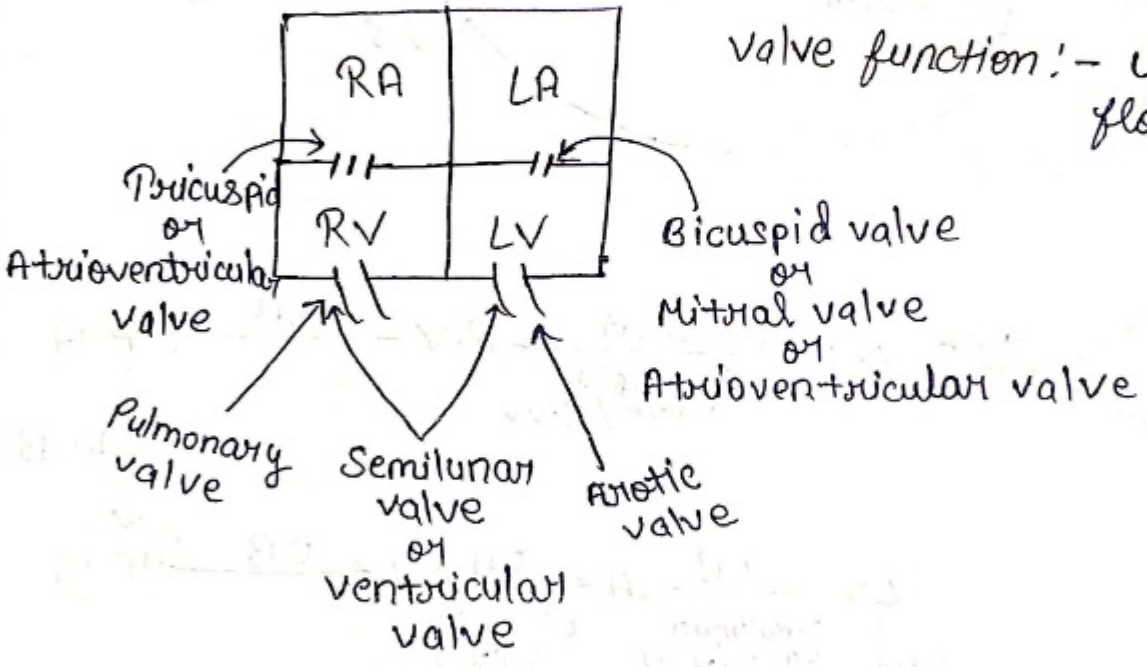
- Sino-atrial Node (SA Node = SAN)
- Atrio-ventricular Node (AV Node = AVN)
- Atrio-ventricular bundle (AV bundle)
- Right and Left bundle
- Purkinje fibres
- ventricles

In Short (recap)

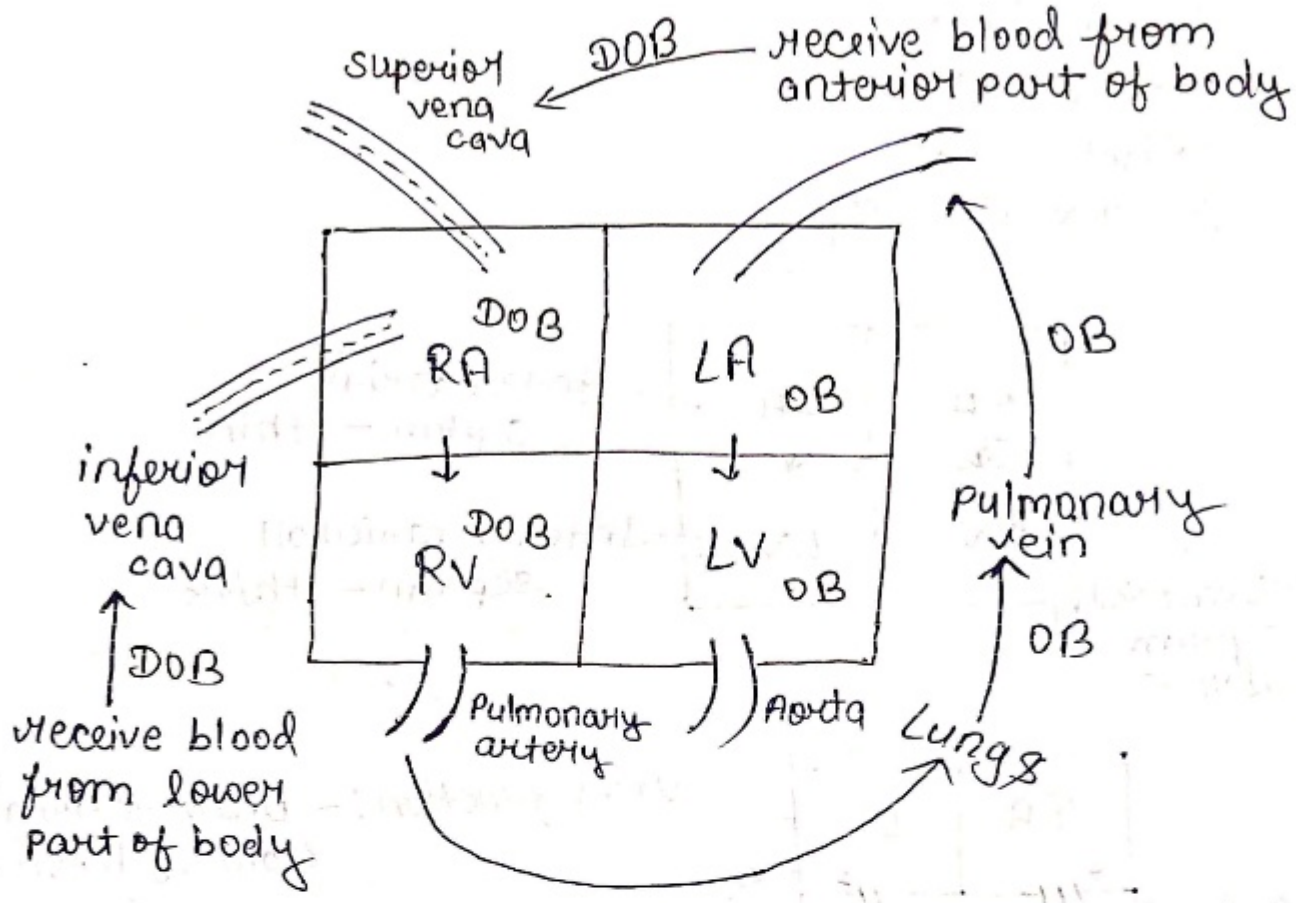
- Heart
- Thoracic chamber between lungs
- Muscular tissue
  - epithelial tissue
  - connective tissue
  - muscular tissue — cardiac tissue
  - Nervous tissue
- Size clenched fist
- weight :- 230 gm - 340 gm
- Double fold covering
  - Pericardium
    - fluid - Pericardium fluid (reduce friction, jerk).
      - epicardium
      - myocardium
      - endocardium

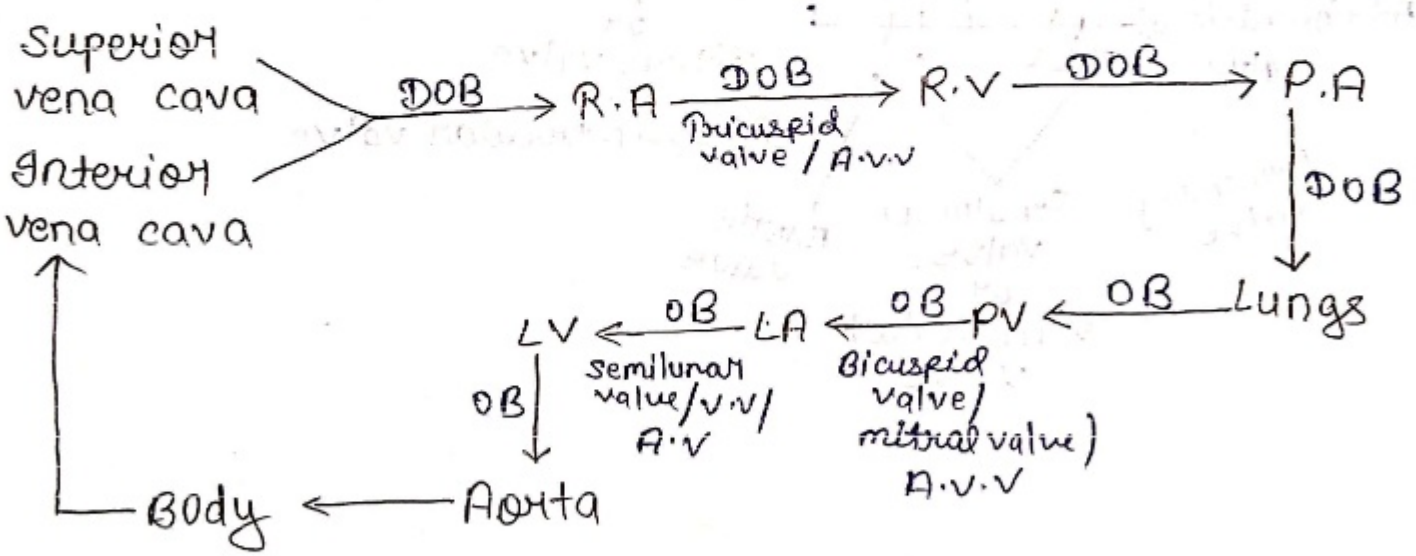
Right Atrium	Left Atrium
Right Ventricle	Left ventricles

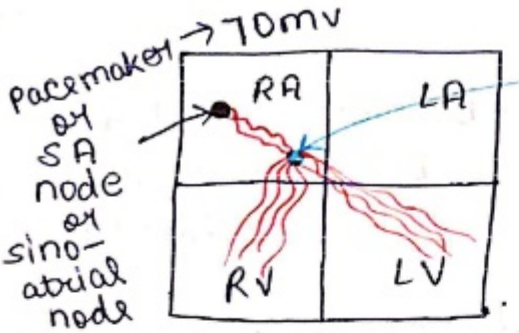




Valve function :- undirectional flow of blood.


Superior vena cava
DOB
receive blood from anterior part of body
DOB
RA
LA
OB
OB
inferior vena cava
DOB
RV
LV
OB
Pulmonary vein
OB
DOB
receive blood from lower part of body
Pulmonary artery
Aorta
Lungs


Superior vena cava
Anterior vena cava
DOB
R.A
DOB
Bicuspid valve / A.V.V
R.V
DOB
P.A
DOB
Lungs
OB
PV
OB
LA
OB
LV
OB
Body
Aorta
semilunar valve/V.V/ A.V
Bicuspid valve/ mitral valve) A.V.V



lower left corner of Right atrium atrio-ventricular node (AV Node) or pace setter

current flow

Right upper corner of the right atrium

SA Node → AV Node

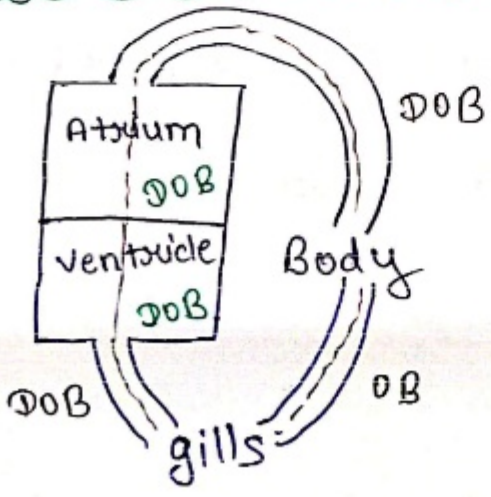
↓ Produce → 70mv → Heart beat 72/min

↓ Purkinje fibre → Right Bundle, left bundle → Bundle of HIS → ventricles

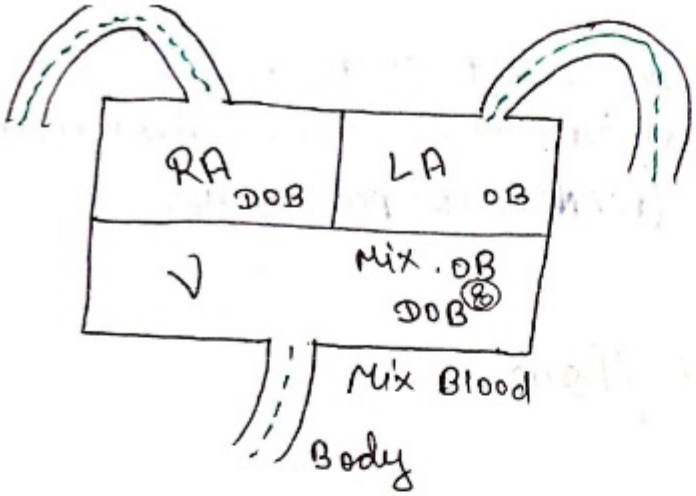
:- two circulation

- Pulmonary circulation
- Systemic circulation

Single circulation



Heart recived DOB & pumped DOB
eg- Fish



DOB → Deoxygenated blood (more CO_2 & blood)

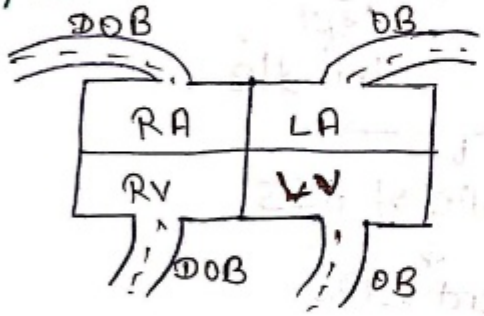
OB → oxygenated blood (more O_2 in blood)

Heart recive DOB & OB seperately but pump mix blood eg → Amphibians & Reptiles

[except :- Crocodiles]

:- Incomplete 2 Double circulation

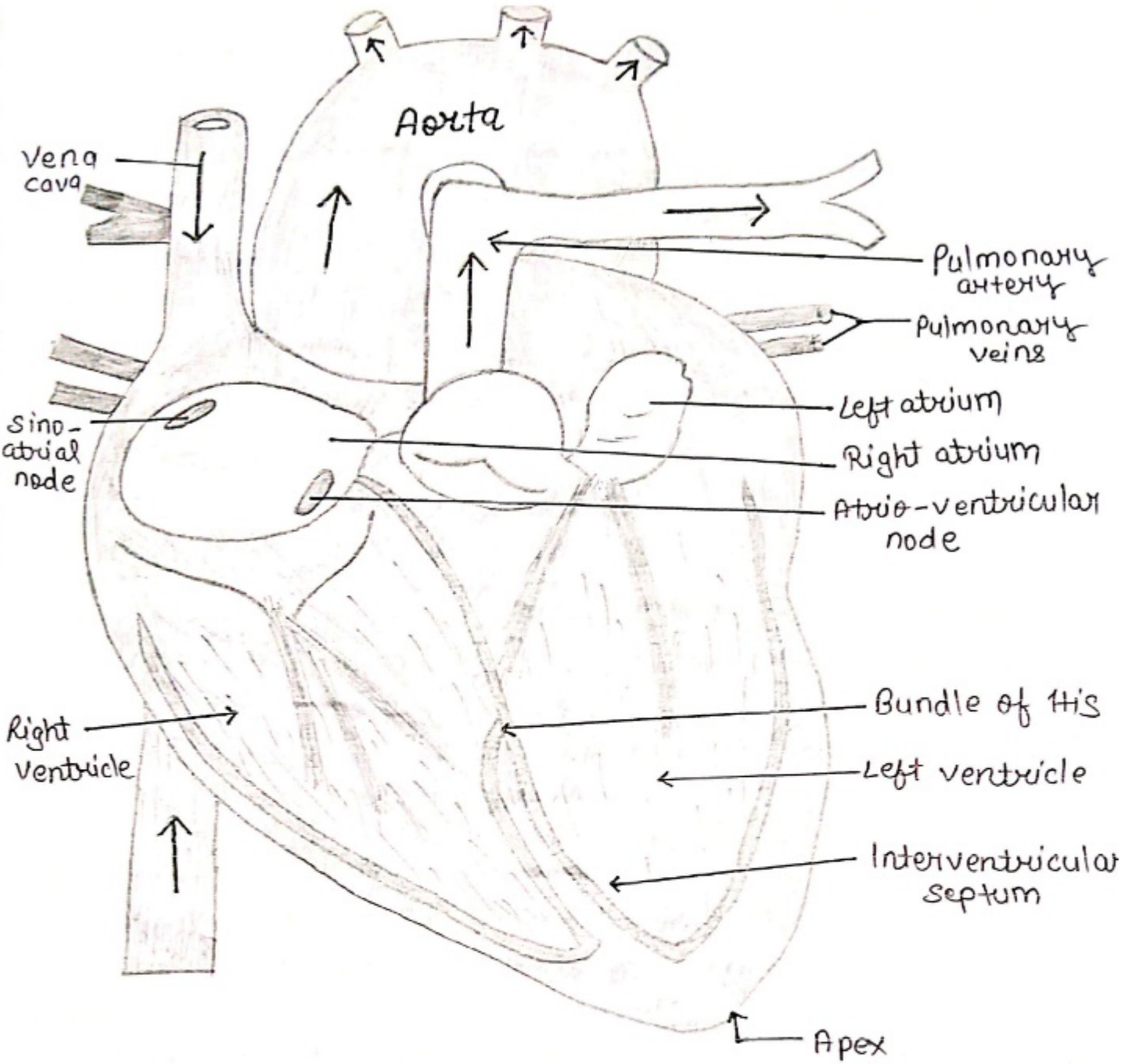
:- Complete double circulation



Heart recive DOB & OB seperatly & pump DOB & OB seperatly.

eg :- Mammals & Bird (Human) & Crocodile

- Blood from superior and inferior vana cava is received by the right atrium.
- DOB pumped into the pulmonary artery is passed on to the lungs.
- This kind of circulation is systemic circulation.



Section of heart

Cardiac Cycle

→ One cycle of contraction and relaxation of cardiac muscle is termed as a cardiac cycle.

→ The period of contraction is called systole while the period of relaxation is known as diastole.

→ A cardiac cycle is formed by the systole and diastole of both atria and ventricles and is divided into four phases:

Joint diastole :-

Joint diastole stage is the relaxation stage of all the four chambers of the heart. Blood from the pulmonary veins and vena cava flows into the left and the right ventricle respectively through the left and right atria as the tricuspid and bicuspid valve open. At this stage, the semilunar valves remain closed.

Atrial systole

An action potential is generated by the SAN that stimulates both the atria to undergo a simultaneous contraction – the atrial systole which result in increment in the flow of blood in the ventricles by about 30%.

Ventricular systole

→ The action potential generated previously is now passed on to the ventricular side by the AVN and AV bundle, where the bundle of His transfers it through the entire ventricular musculature.

↳ This leads to the contraction of the ventricular muscles which is nothing but a ventricular systole.

↳ At the time, the atria are in a relaxed stage or the diastole, thus coinciding with the ventricular systole.

• The ventricular pressure is increased by the ventricular systole. causes the closing of tricuspid & bicuspid valves because of attempted backflow of blood into the atria.

• As the ventricular pressure increases further, the semilunar valves guarding the pulmonary artery (right side) and the aorta (left side) are forced open, allowing the blood in the ventricles. to flow through these vessels into the circulatory pathways.

During ventricular systole

→ semilunar valves are forced open, the bicuspid and tricuspid valves become closed during ventricular systole. (produce a sound LUB.)

Ventricular diastole

→ Ventricles relax and the pressure in them falls leading to the closure of the semilunar valves that prevent the backflow of blood into the ventricles.

→ Ventricular pressure declines further, the tricuspid & bicuspid valves are pushed open by the pressure in the atria exerted by the blood.

↳ The blood can now move freely to the ventricles once again. Now, the ventricles and atria are again in joint diastole.

S.NO.	Event	A.V.V (Bicuspid & tricuspid valve)	Semilunar values
1	Joint diastole	open	closed
2	Atrial Systole	open	closed
3	Ventricular systole	closed	open
4	Ventricular diastole	open	closed

↳ 1 cardiac cycle in one heartbeat

↳ 72 heart beats indicate that the same number of cardiac cycles occur in that particular minute.

↳ Every cardiac cycle takes about 0.8 sec (60/72).

↳ The amount of blood pumped by each ventricle during a cardiac cycle.

↳ Stroke volume is approx. 70 ml

* Cardiac output

↳ Stroke vol. multiplied by the heart rate (i.e - no. of beats per min)

↳ The volume of blood pumped out by each ventricles per minute is defined as the cardiac output and it averages 5000 ml or 5 l in a healthy individual.

↳ Cardiac output = Stroke volume × Heart rate
= 70 ml × 72/min
= 5040 ml/min

↳ Body can change the stroke volume as well as the heart rate, alternating the cardiac output.

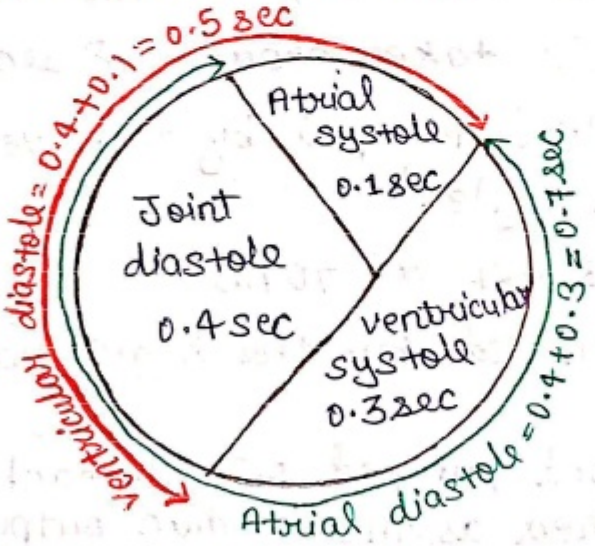
↳ Who has a greater cardiac output when compared to that of an ordinary person.

↳ Stethoscope is helpful in hearing two distinct sounds that are generated in every cardiac cycle.

↳ Lub is the first sound that is produced by the closure of the tricuspid & bicuspid valves whereas dub is the second sounds that produce due to the closure of semilunar valves.

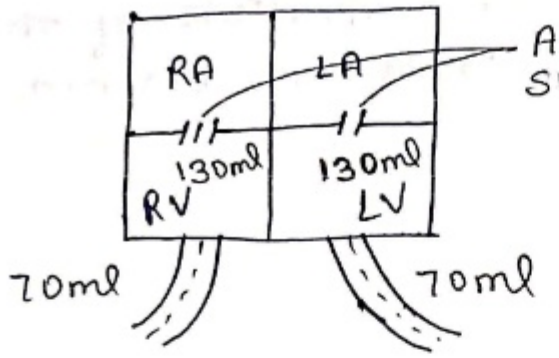
↳ These two heart sounds are of clinical significance during a diagnosis.

* LUB is also known as S_1
* DUB is also known as S_2



Heart sound
Produce due to closing of Atrio ventricular & ventricular valve.

$S_1 - S_2 = 0.3$
$S_2 - S_1 = 0.5$



Atrial systole blood supply 1es 30% in the ventricles.

Stroke volume :- Each ventricle of heart pumped 70ml Blood during one cardiac cycle called Stroke volume.

Stroke volume = End of Distolic vol. − End of systolic vol

(or)

S.V = ED − EV

* Electrocardiograph (ECG)

→ Patient suffers from cardiac arrest. monitoring machine that shows voltage traces on a screen and creates the sound "pip.... pip.... pip..... peeeeeeeeee" :- Electrocardiogram (ECG)

→ Electrocardiograph machine that makes this sound.

→ Represent the electrical activity that occurs in the heart during a cardiac cycle.

→ Three electrical leads are connected to the patient (one to each wrist and to the left ankle) that continuously monitor the heart activity are used to obtain a standard ECG.

→ Any deviation from this shape indicates a possible abnormality or disease as the ECGs obtained from different individuals have roughly the same shape for a given lead configuration.

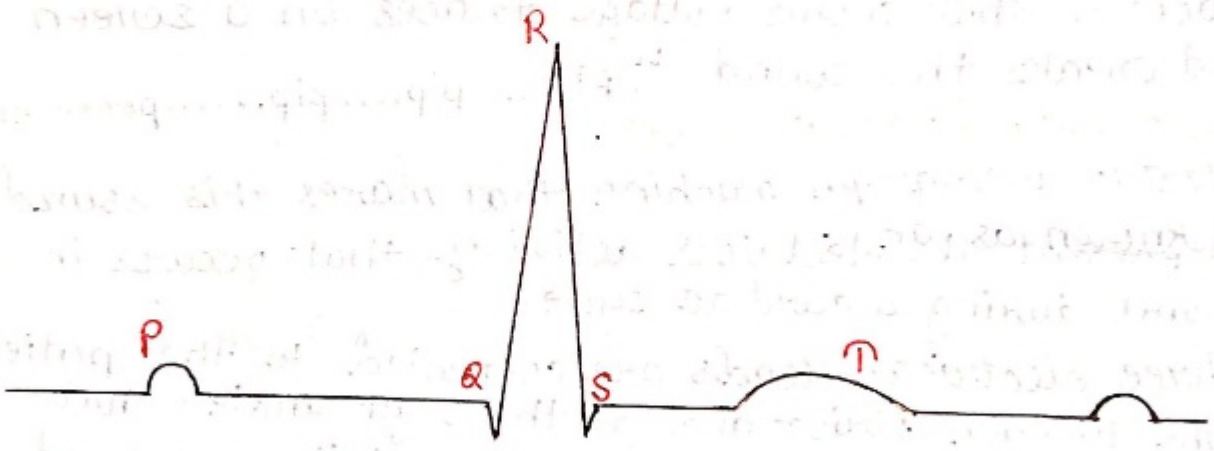
↳ In order to obtain a detailed evaluation of the heart's functioning, multiple leads are attached to the chest region.

Standard ECG

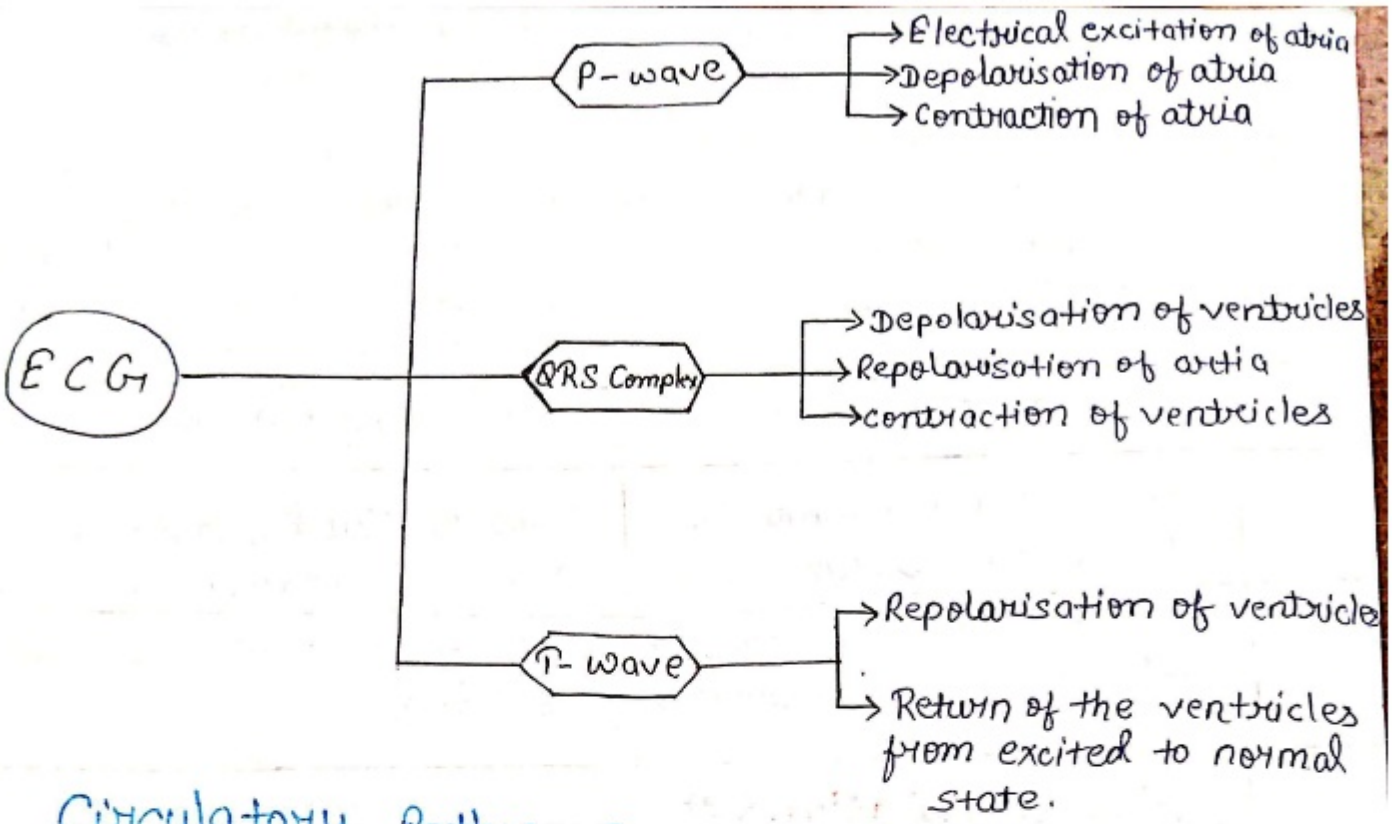
⟶ Standard ECG consists of a P-wave, a QRS complex and a T-wave. Every peak identified in the ECG with a letter from P to T.

⟶ Correspond to a specific electrical activity of the heart.

Note:- Polarisation is not a electrical activites of heart so, this is a detech in ECG. i.e. only distole not record ECG.



-: Presentation of a standard ECG :-



Circulatory Pathways

→ All vertebrates have a muscular chambered heart.

S.No	Group	No. of chambers in the heart	Name of chambers in the heart.
1	Fishes	2	1 atrium + 1 ventricle
2	Amphibians	3	2 atrium + 1 ventricle
3	Reptiles (Except crocodiles)	3	2 atria + 1 ventricles
4	Crocodiles, Birds and Mammals	4	2 atria + 2 ventricles

S.NO.	open circulatory system	closed circulatory system
1	Blood pumped by heart passes through large vessels into open spaces or body cavities called sinues.	Blood pumped by the heart is always circulated through a closed network of blood vessels. (artery, vein & capillary).
2.	Less advantageous	More advantageous
3.	Flow of fluid connot be more precisely regulated.	Flow of fluid can be more precisely regulated.
4.	It is present in arthopods, molluscs, and hemicordates.	It is found in annelids and chordates.

Special circulations

1) Hepatic Portal circulation :-

↳ A portal vein is the vein that does not carry blood directly to the heart but carries blood to another organ.

→ Hepatic portal system is a unique vascular connection that exists between the digestive tract and liver.

→ Blood from the digestive tract is carried to the liver by the hepatic portal vein before it goes into the systemic circulation.

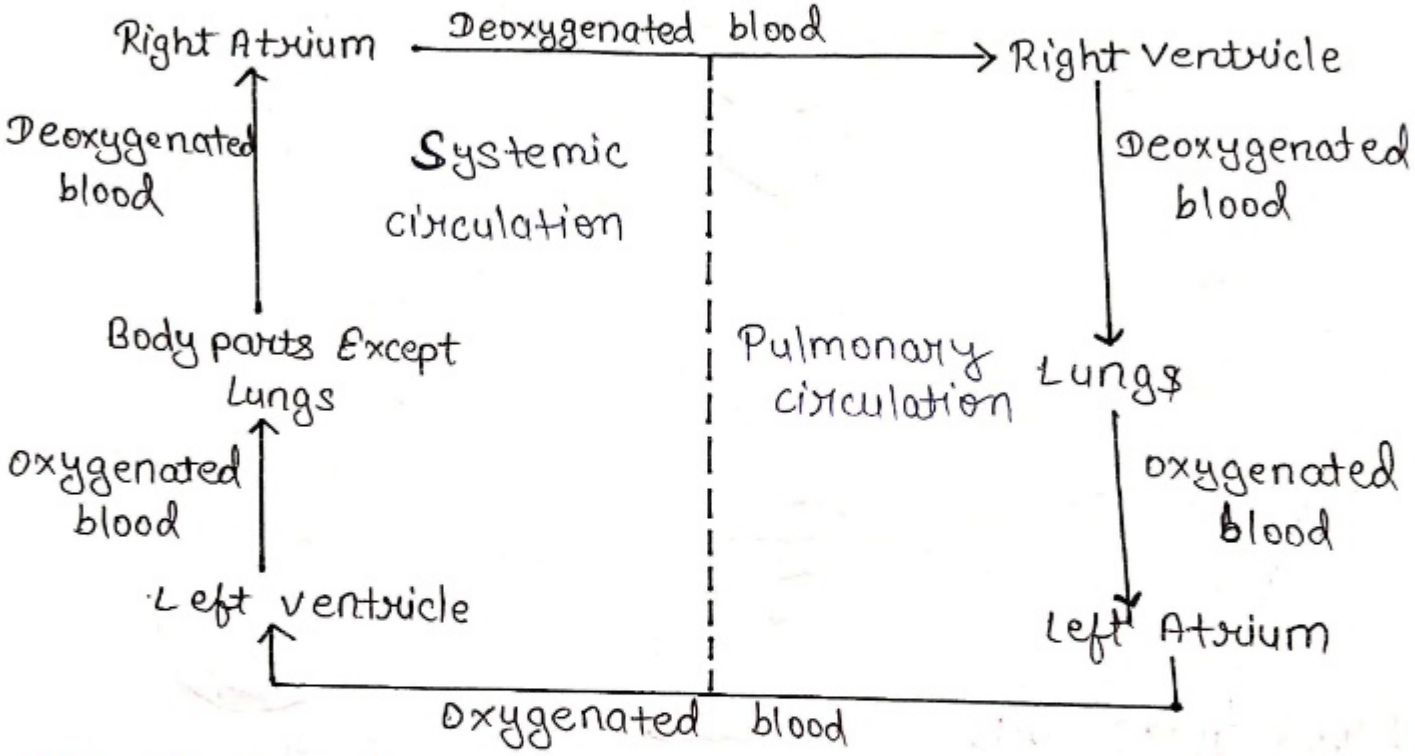
→ It is also carries the glucose from the digestive tract to liver.

→ Blood from liver leaves it through the hepatic vein.

Coronary circulation :-

→ For the circulation of blood to and from the cardiac musculature, a special coronary system of blood vessels is present in our body.

→ Oxygenated blood to the heart muscle is supplied by the coronary arteries.



Blood vessels

- Every artery and vein is made of three layers:

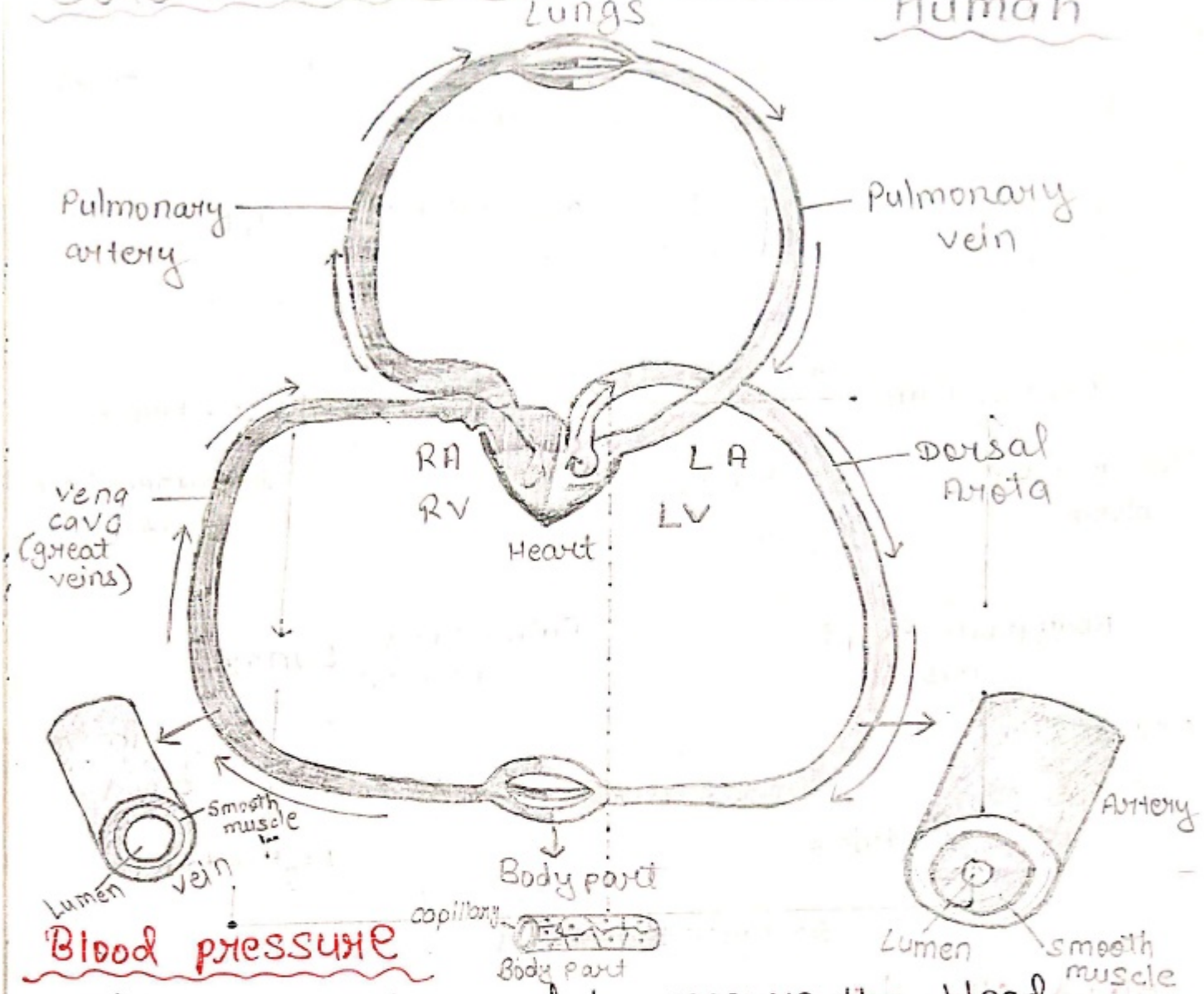
a) Tunica intima :- Inner lining squamous endothelium.

b) Tunica media :- thickest layer middle, made of smooth muscle & elastic fibres.

- In veins, the tunica media is comparatively thinner.

c) Tunica externa :- External layer of fibrous connective tissue with collagen fibres.

Schematic plan of blood circulation in human



Blood pressure

→ Sphygmomanometer used to measure the blood pressure and the normal blood pressure.

↳ Healthy individual is 120/80 mm Hg.

→ 120 mm Hg is systolic

⟶ 80 mm Hg is diastolic

120 = Numerator

80 = Denominator

Regulation of Cardiac Activity

→ The heart is called myogenic (muscle) as the normal activites of the heart are regulated intrinsically i.e. auto regulated by specialised muscles (nodal tissue).

→ Cardiac function is moderated by a special neural centre (cardiovascular centre) in the medulla oblongata through autonomic nervous system (ANS).

→ An increases in the heartbeat rate, the strength of ventricular contraction and therefore the cardiac output is brought about by the neural signals through the sympathetic nerves (part of ANS)

→ Secretion of → Noradrenaline (or) Norepinephrine } by the sympathetic nerves ↑es the heart beat.

→ ↓es in the heartbeat rate, speed of conduction of action potential & therefore the cardiac output is brought about by parasympathetic neural signals that are another component of ANS.

S.NO.	Sympathetic Neural signals	Parasympathetic Neural signals
1.	Increase the rate of heart-beat.	Decreases the rate of heart beat.
2.	Increase the strength of ventricular contraction.	Decrease the speed of conduction of action potential
3.	Increases the cardiac output	Decrease the cardiac output

Disorders of circulatory System

1) High Blood pressure (Hypertension): Hypertension or high blood pressure is occurs when the blood pressure is higher than normal which is 120/80 mm Hg. When repeated checks of blood pressure of an individuals are 140/90 (140 over 90) or higher is the condition called hypertension. Hypertension leads to heart diseases and also affects vital organs such as brain and kidney.

2) Coronary Artery Disease (CAD): One of the most common diseases, CAD affects the vessels that supply blood to the heart muscle and is caused by accumulation of calcium, fat, cholesterol and fibrous tissues, which results in narrowing of the lumen of the artery. It is also known as atherosclerosis.

3) Angina: When enough oxygen does not reach heart, the condition is called angina pectoris. It has a symptom of acute chest pain. Angina may affect men and women of any age but it is more common among the elderly and middle aged. The factors that affect the blood flow are responsible of angina as well. Lesser oxygen reaches the heart muscles when a person suffers from angina.

4) Heart failure: Heart failure is said to have occured when the heart fails to pump enough blood to meet the bodily requirements. Congestion of lungs is one of the main symptoms of this disease and hence heart failure is sometimes called congestive heart failure (CHF). Although they seem similar, heart failure is not same as a cardiac arrest or a heart attack.

5) Cardiac Arrest: Cardiac arrest is said to occur when the heart stopes beating.

6) Heart attack (Myocardial Infarction): Myocardial infarction (MI) is said to occur when the heart muscles are suddenly damaged by inadequate blood supply.