



## **Government of Tamilnadu**

### **Department of Employment and Training**

Course : TNPSC Group II Exam

Subject : Zoology

Topic : **Blood Circulation**

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**Commissioner,**  
**Department of Employment and Training.**



# BLOOD CIRCULATION

Blood circulation means, blood is transported from one part of a body to another part of the body. The essentials are

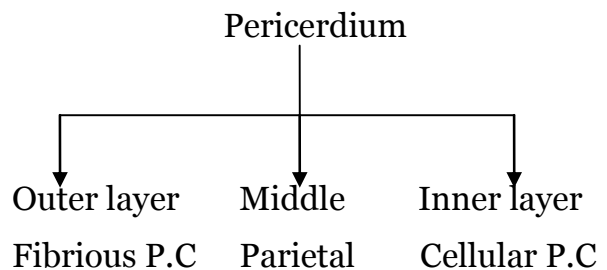
1. Blood
2. Pumping organ - Heart
3. Vessels - Arteries, Veins, Capillaries

## HEART

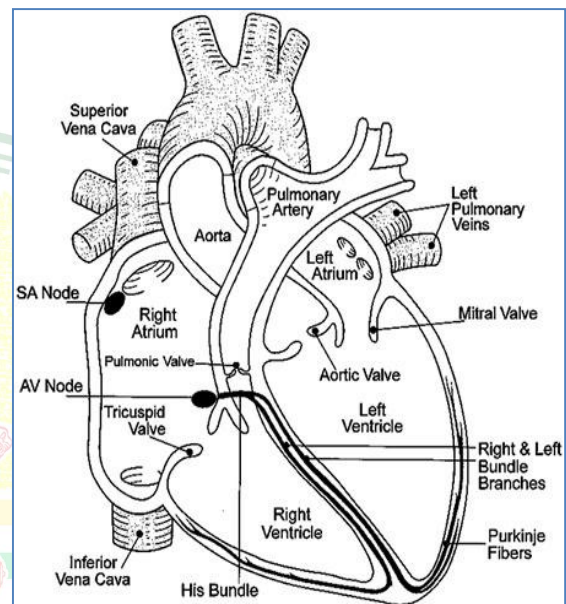
Willam Harvey

- Heart acts as pump
- Valves are present in veins  
(Valves were first reported by Fabricious)

- ❖ Heart is a hollow muscle – fibarous organ
- ❖ Conical (or) Pyrimidal in shape
- ❖ It has the size of a clenched fist
- ❖ Length 12 cm diameter 8-9 cm
- ❖ Weight is about 230 -280 gms
- ❖ It has four chambers
- ❖ It is situated in the mediastinum area
- ❖ It is protected by a double walled pericardial membrane

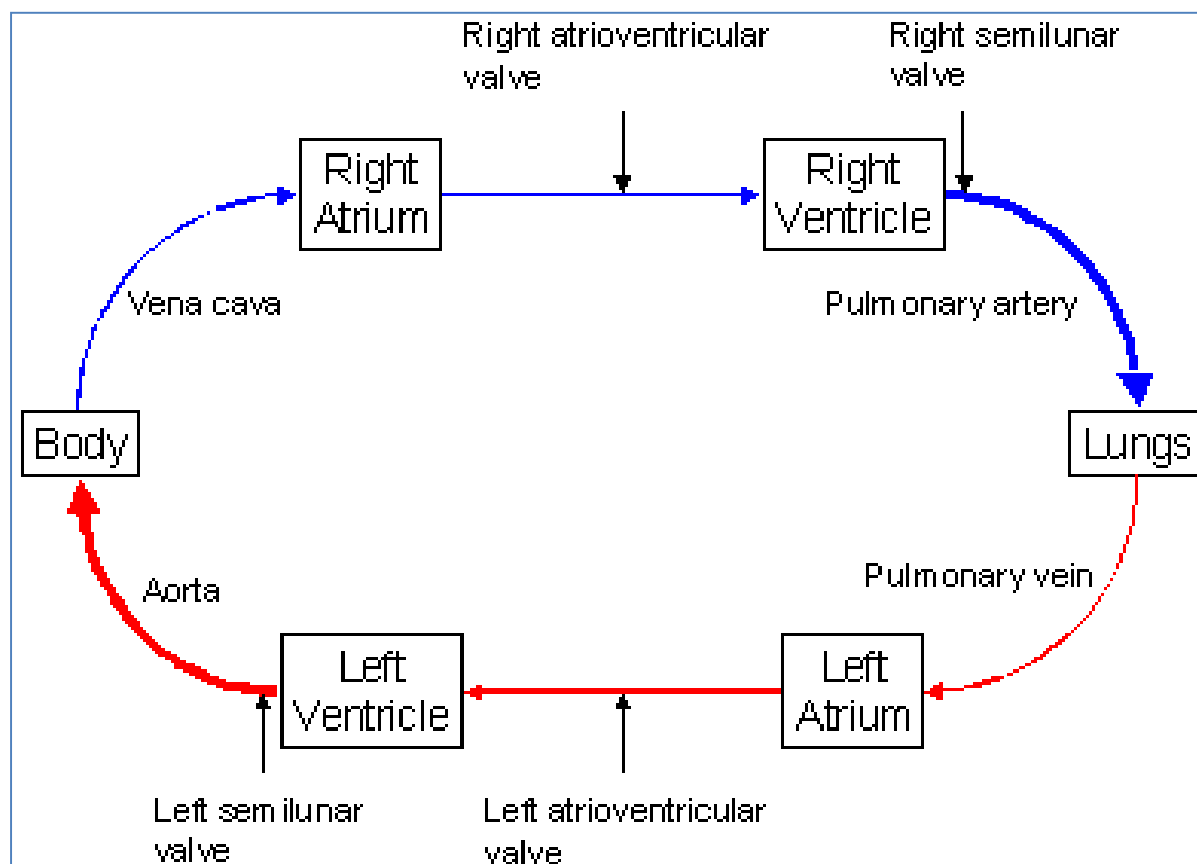


Pericardium



### Heart wall is made up of 3 layers

- ❖ Epicardium – outer part
- ❖ Myocardium – middle part
  - It is made up of muscle tissues
  - It is important in heart functioning
- ❖ Endocardium – inner part



### Double Circuit Circulation

In Mammals double circuit circulation is found. i.e. the blood flow in heart twice a time.

### Capillaries :

- ❖ Its made up of Elastin and collagen fibres
- ❖ Size 5-7 microns
- ❖ It connects arteries to veins
- ❖ It transports  $O_2$ ,  $CO_2$ , food , water, ions, vitamins, hormones and Anti oxins

### **1) Pulmonary Circuit**

- Right atrium → Right ventricle → pulmonary artery  $\xrightarrow{O_2}$  lungs → Pulmonary vein → left atrium

The blood circulation for the wall of blood vessels is conducted by vasa vasorum

### **2) Hepatic portal circuit**

- Body part (spleen, pancreas, reproductive organs, intestine) veins → liver → inferior vena cara Right Atrium

## BLOOD CIRCULATION

ARTERY	VEIN
<ul style="list-style-type: none"> <li>• Distributing vessel</li> <li>• Pink in colour</li> <li>• Deep in location</li> <li>• All arteries have pure (or) oxygenated blood except pulmonary artery</li> <li>• Blood flows with pressure</li> <li>• Wall is elastic               <ol style="list-style-type: none"> <li>1. Girding vessels</li> <li>2. Dispersing vessels</li> <li>3. Blocking vessels</li> </ol> </li> <li>• 30-40 microns in size</li> <li>• Non Collapsible</li> <li>• More muscular</li> <li>• Internal valves are absent</li> <li>• Smallest arteries divided and break into arteriole</li> <li>• Progressively divides and decrease in size</li> <li>• 3 distinct layers</li> <li>• Tunica externa</li> <li>• Tunica media (Thick)</li> <li>• Tunica interna</li> </ul>	<ul style="list-style-type: none"> <li>• Collecting Vessel</li> <li>• Red in colour</li> <li>• Superficial in location</li> <li>• All veins carry impure or deoxygenated blood except (pulmonary vein)</li> <li>• Blood flows with low pressure</li> <li>• Wall is not elastic</li> <li>• Due to this it stores more blood. So the blood flows in low pressure also</li> <li>• 30 microns only</li> <li>• Collapsible</li> <li>• Less muscular</li> <li>• Internal valves are present (2mm above)</li> <li>• Smallest vein arises from venule</li> <li>• Progressively uniting and increasing in size</li> <li>• 3 distinct layers</li> <li>• Tunica externa</li> <li>• Tunica media (Thin)</li> <li>• Tunica interna</li> </ul>

Valves	Situated at
1. Bicuspid valve (or) mitral valve	– left auricular ventricular opening
2. Tricuspid valve	– right auricular ventricular opening
3. Semilunar valve	– at the opening of aorta from ventricle
4. Haversian valve	– end of opening of superior vena cava
5. Eustachian valve	– end of opening of inferior vena cava
6. Thebesian valve	– opening of coronary sinus

### Circulation of blood

- 1) The impure blood of body is collected by inferior vena cava, superior vena cava and it is poured in to right atrium by coronary sinus (coronary sinus – collects impure blood from heart walls)
- 2) It pours in to right ventricle by tricuspid valves
- 3) From here it departs through pulmonary artery to lungs after purification it starts by pulmonary veins and reach left atrium
- 4) By bicuspid valve it reaches left ventricle from here it starts from aorta in the supply to all over the body parts.

- ❖ A patch of nodal tissue present in upper corner of right atrium 1.5 cm x 3 mm
- ❖ The another mass of tissue seen in the lower left corner of right atrium close to the atrio-ventricular septum called atrio-ventricular node.
- ❖ The impulse passes from AV node to bundle of His and Purkinje fibres
- ❖ The regular heart beat starts.

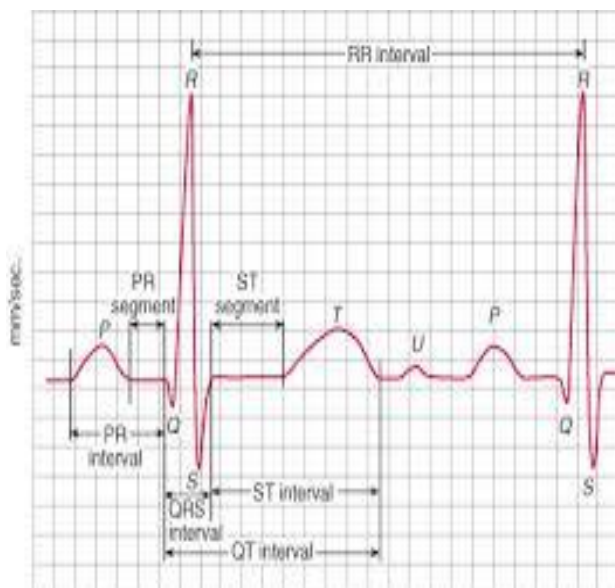
### HEART BEAT

- ❖ Rhythmic contraction and relaxation of auricles & ventricles
- ❖ A single cardiac cycle represented by a single heart beat
- ❖ It includes one systole and one diastole
- ❖ Heart beat in man = 72 per minute
- ❖ In children = 100 per minute

### HEART INDUCTION AND SPREADING OF IMPULSE

- ❖ SA node/ Sino – auricular node / Pacemaker / Keith & Flock Node

## BLOOD CIRCULATION



❖ In newborn baby = 120-140 per minute

### Single cardiac cycle

Auricular systole - 0.1 min	} 0.8 min
Auricular diastole - 0.7 min	
Ventricular systole - 0.3 min	} 0.8 min
Ventricular diastole - 0.5 min	

- ❖ Less number of heart beat than normal – Bradycardia
- ❖ More rate of heart beat than normal – Tachycardia

### Rate of heart beat increases

- 1) Due to increased respiration
- 2) By hot drinks
- 3) Shock and tension
- 4) Fall in  $P^H$  value of blood
- 5) High blood pressure
- 6) Excess quantity of food intake

### Rate of heart beat decreases:

- 1) Heart failure - When SA node does not initiate any impulse
- 2) Heart block - When Av node damage
- 3) Circulator arrest - blood flow completely stops
- 4) Arteriosclerosis - Excessive deposition of cholesterol with calcium salts.

### Heart Sounds

- ❖ Sounds were produced in a regular series
- ❖ Heard by stethoscope invented by Rene Laennec

**I sound** : Its known as L.U.B.B prolonged time 0.16 - 0.9 se dull sound

- ❖ Created by closer of atrio ventricular valve at the time of ventricular systole

**II sound** : Its known as D-U-B-B

Short time 0.10 sec

- ❖ High pitch sound
- ❖ Created by closer of semilunar valves at the time of ventricular diastole



## **Blood Pressure**

Developed by flow of blood on the wall of blood vessel factors :

- |                                                                   |                                                                     |
|-------------------------------------------------------------------|---------------------------------------------------------------------|
| 1) Amount of blood                                                | ❖ Electrocardiogram E.C.G                                           |
| 2) Viscosity of blood                                             | ❖ Invented by Einthoven 1906                                        |
| 3) Flow of blood                                                  | ❖ It is first recorded by waller 1907                               |
| 4) Elasticity of blood vessel                                     | ❖ Its recorded activities of heart on paper                         |
| ❖ Measuring instrument :<br>Sphygmomanometer (Korotkoff 1905)     | ❖ P wave - due to activation of SA node                             |
| ❖ It is measured at the point of<br>brachial artery of fore arm   | ❖ PQ wave - Its interval representation when article contracts      |
| ❖ Higher limit – systolic blood pressure / atrial contraction     | ❖ RS wave - Speed of impulse from AV node to bundle of His purkinje |
| ❖ Lower limit – diastolic blood pressure/ ventricular contraction | ❖ ST wave - interval period of ventricular ejection.                |
| ❖ Normal B.P. of man = 120 (systolic) / 80 (diastolic) mm Hg      | ❖ P wave - 0.20 sec                                                 |
|                                                                   | ❖ P-R interval - 0.25 sec                                           |
|                                                                   | ❖ QRS interval - 0.35 sec                                           |
|                                                                   | ❖ T wave - 0.20 sec                                                 |

## **Factors influence the B.P**

- |                           |                                                              |
|---------------------------|--------------------------------------------------------------|
| 1. Thickening of arteries | ❖ First heart transplant operation :<br>Dr. Christian Bernad |
| 2. During exercise        | ❖ First artificial heart operation :<br>Dr. Alexis Koral     |
| 3. During Tension         |                                                              |
| 4. During fear            |                                                              |
| 5. By adrenal secretion   |                                                              |
| 6. Increase of age        |                                                              |
| 7. during nephritis       |                                                              |
| 8. hereditary condition   |                                                              |
| 9. due to obesity         |                                                              |