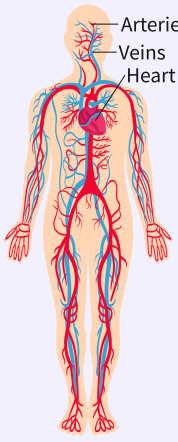
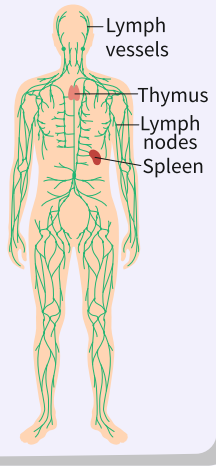
15. BODY FLUIDS AND CIRCULATION

HUMAN CIRCULATORY SYSTEM



- **BLOOD VASCULAR SYSTEM**
  - **Heart**
  - **Blood**
  - **Blood Vessels**
    - Arteries
    - Capillaries
    - Veins
- **LYMPHATIC SYSTEM**
  - **Lymph**
  - **Lymph Vessels**
  - **Lymph nodes**



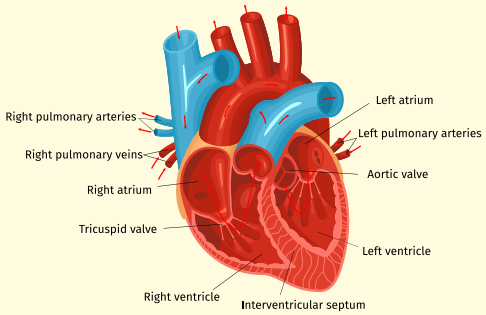
BLOOD

- **Plasma**
  - Albumin
  - Globulin
  - Fibrinogen
- **Formed Elements**
  - Red Blood Cells
  - White Blood Cells
  - Platelets

Leukocyte/white blood cell (WBC)

- **Granular**
  - **Eosinophil**
  - **Basophil**
  - **Neutrophil**
- **Agranular**
  - **Monocyte**
  - **Lymphocyte**
    - **T - Lymphocyte**
    - **B - Lymphocyte**

STRUCTURE OF HEART



- Mesodermally derived
- Protected by pericardium Layer
- **Chambers** – Upper two auricles and Lower two ventricles
- **Valves**:-
  1. **Tricuspid** [Between right atrium & right Ventricle
  2. **Bicuspid**:- [Between Left atrium and Left ventricle]
  3. **Semilunar**:- [At the opening of right & Left ventricles into pulmonary artery and aorta respectively)
- **Nodes**:-
  1. **Sino – Atrial Node (SAN)**:- At the right atrium's top right.
  2. **Atrio – Ventricular Node (AVN)**:- At the right atrium's bottom left corner close to the atrio – Ventricular Septum.

BLOOD GROUPS

ABO Grouping

Blood Group	Antigen	Antibodies	Can donate blood to	Can receive blood from
A	A	Anti - B	A and B	A, O
B	B	Anti – A	B and AB	B,O
AB	A,B	Nil	AB only	A,B,AB and O
O	Nil	Anti-A & Anti-B	A,B, AB & O	O only

Rh Grouping

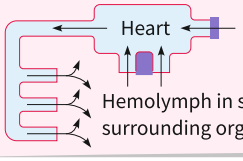
- Presence of Rh factor – Rh +ve
- Absence of Rh factor – Rh -ve

Erythroblastosis Fetalis is caused when fertilization takes place between gametes of Rh -ve female and Rh +ve male.

CIRCULATORY PATHWAYS

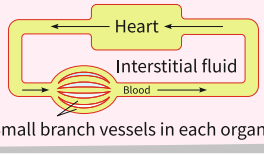
Open Circulatory System

Blood Pumped by heart flows freely through cavities or Sinuses.



Closed Circulatory System

Blood pumped by the heart is circulated through blood vessels.



CARDIAC CYCLE

Cyclic Contraction and relaxation of heart for pumping blood.

1 heartbeat = A lub + A Dub

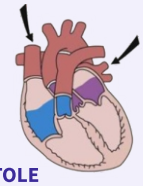
One heartbeat is equal to a single cardiac cycle.

Stages of Cardiac Cycle

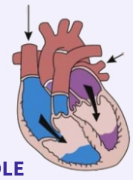
- **Joint Diastole**
- **Atrial Systole & Diastole**
- **Ventricular Systole & Diastole**

A cardiac cycle is completed in 0.8seconds.

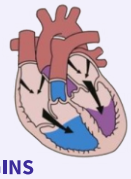
Description of a Cardiac cycle



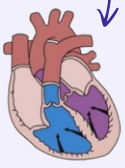
1. DIASTOLE
- Atria fill
- All valves closed



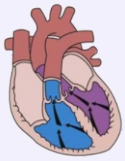
2. DIASTOLE
- Increased atrial pressure opens AV valves
- Ventricles fill



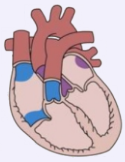
3. SYSTOLE BEGINS
- Atria contract and empty
- Ventricles are full



4. SYSTOLE
- Ventricles begin contraction
- Pressure closes AV valves
- Atria relax



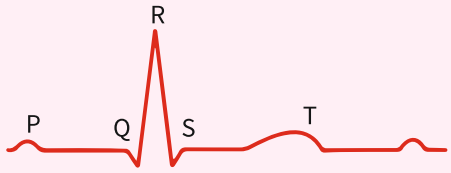
5. SYSTOLE
- Ventricles contract
- Increased pressure in ventricles
- Aortic and pulmonary valves open
- Blood ejected into aorta and pulmonary artery



6. DIASTOLE
- Ventricles empty & relax.
- Aortic and pulmonary valves close.

ECG (ELECTROCARDIOGRAPH)

- P – Wave
- QRS – Complex
- T – Wave

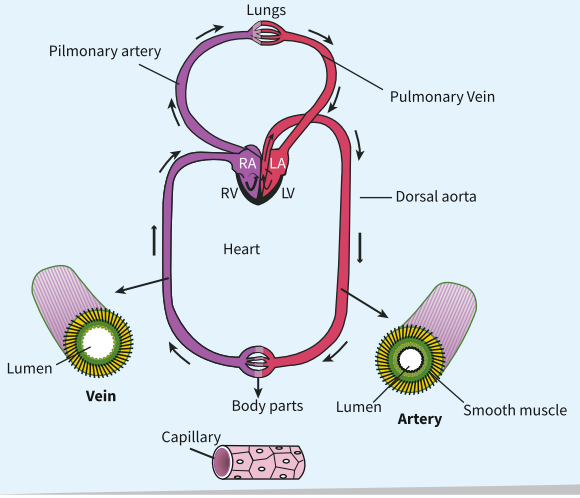


Machine (electro-cardiograph) is used to obtain an electrocardiogram (ECG).
The P-wave - electrical excitation (or depolarisation) of the atria. The QRS complex - depolarisation of the ventricles. The T-wave - return of the ventricles from excited to normal state (repolarisation). The end of the T-wave marks the end of systole.

DOUBLE CIRCULATION

Pulmonary Circulation
- Circulation between Lungs and heart
- Lesser Circulation

Systemic Circulation
- Circulation between heart and various body parts.
- Greater circulation



Regulation of Cardiac Activity

Adrenal medullary hormone - Increase the Cardiac Output

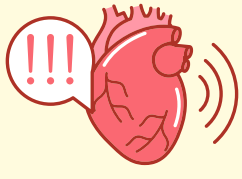
medulla oblangata can moderate

ANS

Sympathetic nerve
Increase rate of heart beat, the strength of ventricular contraction and the cardiac output.

Parasympathetic nerve
Decrease the heartbeat, speed of conduction of action potential and the cardiac output.

DISORDERS OF CIRCULATORY SYSTEM



Cardiac Arrest

When heart stops beating.

Heart failure (Congestive heart failure)

Condition in which heart is not pumping blood enough to meet the needs of the body.

Caronary Artery Disease (CAD) or Atherosclerosis

Fat, Ca, Cholesterol and fibrous tissue gets deposited in coronary arteries restricting blood flow.

Angina (Angina pectoris)

Acute chest pain due to oxygen deficiency to heart muscles.

Hypertension (High blood pressure)

Blood pressure above 120/80mmHg