Class : Zoology
Class : XI

Kannada

BODY FLUIDS AND CIRCULATION

Blood (Special Connective Tissue)

- Blood cells are synthesised in red bone marrow

Functions:

- Transport of nutrients, O_2, glucose, etc.
- Removal of harmful substances

Components:

(1) Plasma (Matrix, 55%)

Water: 90-92%

Proteins: 6-8%

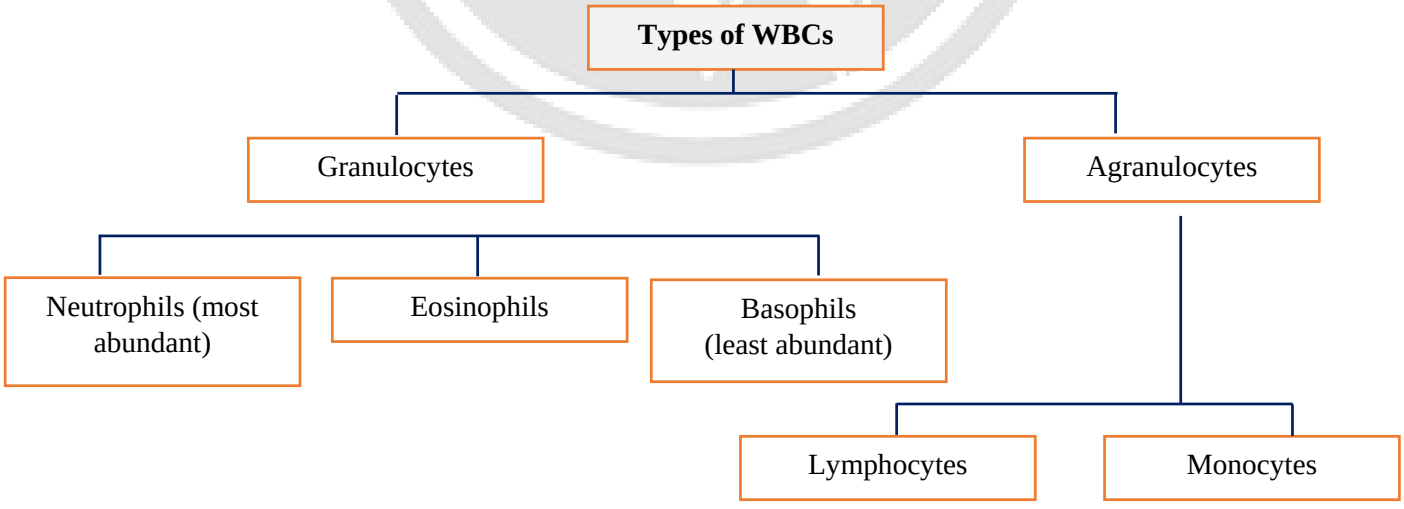
- Fibrinogens – Clotting
- Albumins – Osmotic balance
- Globulins – Defense

Minerals: Na+ , Ca2+, Mg2+, HCO3 – , Cl–

Nutrients: Glucose, amino acids, lipids

(2) Formed Elements (45%)

- RBCs – 5-5.5 million/mm^3
- WBCs – 6000-8000/mm^3
- Platelets – 1,500,00-3,500,00/mm^3



Blood Groups

- ABO blood grouping depends on the presence or absence of two surface antigens on RBC, and plasma contains antibodies.
- AB – Universal recipient
- O– Universal donor

Blood Group	Antigens on RBCs	Antibodies in Plasma	Donor's Group
A	A	ANti-B	A, O
B	B	anti-A	B, O
AB	A, B	nil	A, B, AB, O
O	nil	anti-A, B	O

- Rh – ve person upon exposure to Rh + ve blood will form Rh specific antibodies.
- Erythroblastosis foetalis is the special case of Rh incompatibility.
- Administration of anti-Rh antibodies to the mother immediately after 1st delivery, save baby during 2nd pregnancy.

Blood Clotting/Coagulation

- Coagulum is formed by fibrins.
- Ca^{2+} play important role.

Human Circulatory System

Heart

- **Mesodermally** derived organ
- Protected by a double walled, membranous bag–pericardium with pericardial fluid.
- 4 chambers
  - 2 upper, smaller – Atria
  - 2 lower, larger – Ventricles
- Septum
  - Between atria: Inter-atrial (thin, muscular).
  - Between ventricles: Inter-ventricular (thick walled)
  - Between atrium & ventricle: atrio-ventricular (thick fibrous)

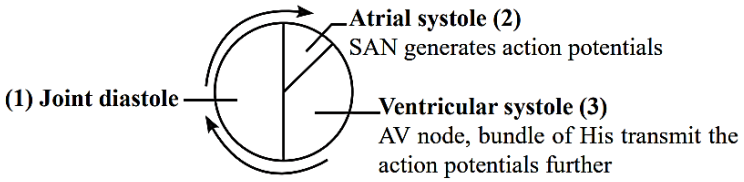
Heart valves

- Between right atrium & right ventricle – Tricuspid valve
- Between left atrium & left ventricle – Bicuspid/Mitral valves
- At the base of pulmonary trunk
- At the base of aorta
- Semilunar valves

Cardiac muscles
- Contractile tissue
- Nodal tissue
  - SA Node
  - AV node
  - AV Bundle
  - Purkinje fibres

Cardiac Cycle

- Sequential events in the heart which are cyclically repeated.
- Heart rate = 72 beats/min.
- Duration of 1 heart beat = 0.8 sec.

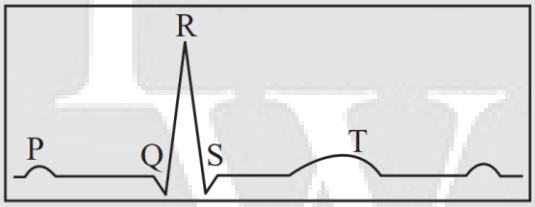


- Heart sounds (lub & dub) can be heard by stethoscope and have clinical diagnostic significance.
- **Cardiac output** = Stroke volume × Heart rate = 70 × 72 = 5040 ~ 5 litres
- Cardiac output of athletes is higher than a normal man
- Stroke volume = EDV – ESV

Electrocardiogram (ECG)

- A graphical representation of electrical activities of heart during a cardiac cycle.
- Instrument – Electrocardiograph
- For a standard ECG – 3 leads are connected to monitor heart activity – Right wrist, left wrist and left ankle

Graphical standards	Represent	Event associated
P wave	Depolarisation of atria	Contraction of atria
QRS complex	Depolarisation of ventricles	Contraction of ventricles
T wave	Repolarisation of ventricles	Relaxation of ventricles



Types of Circulation

Double circulation

+ Pulmonary:

$$\text{Right ventricle} \xrightarrow[\text{artery}]{\text{Pulmonary}} \text{Lungs} \xrightarrow[\text{veins}]{\text{Pulmonary}} \text{Left atrium}$$

+ Systemic:

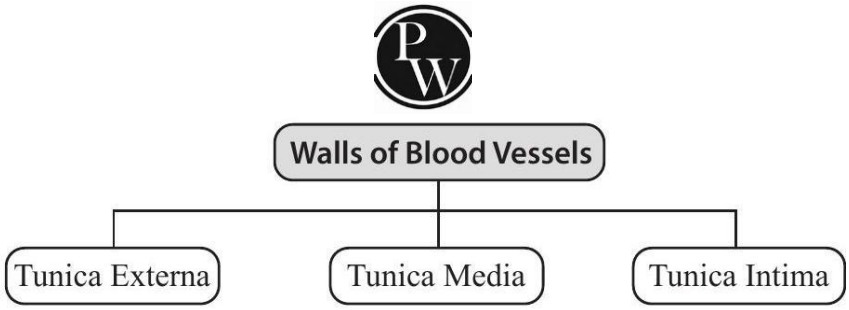
$$\text{Left ventricle} \xrightarrow{\text{Aorta}} \text{Tissues} \xrightarrow{\text{Vena cava}} \text{Right atrium}$$

No mixing of deoxygenated and oxygenated blood occurs.

$$\text{Hepatic portal} \quad \text{Digestive tract} \xrightarrow[\text{vein}]{\text{Hepatic portal}} \text{circulation Liver}$$

Coronary circulation – Blood flow to and from the cardiac musculature

Structure of Blood Vessels



Regulation of Cardiac Cycle

Activities of heart are regulated intrinsically, i.e., autoregulated as human heart is myogenic.

Medulla oblongata can moderat

↓

Cardiac functions through ANS (sympathetic and parasympathetic nervous systems)

Parameter	Sympathetic	Parasympathetic
Heart rate	Increase	Decrease
Strength of ventricular contraction	Increase	Decrease
Cardiac output	Increase	Decrease

Hormones of adrenal medulla increase cardiac output

Disorders of Circulatory System

- Cardiac Arrest, Heart Failure, Coronary Artery disease (Atherosclerosis), High Blood pressure, Angina Pectoris, Heart attack Cardiac Arrest, Heart Failure, Coronary Artery disease (Atherosclerosis), High Blood pressure, Angina Pectoris, Heart attack



PW Web/App - https://smart.link/7wwosivoicgd4
Library- https://smart.link/sdfez8ejd80if