Chapter -18

BODY FLUIDS AND CIRCULATION

POINTS TO REMEMBER

Blood : A special connective tissue that circulates in principal vascular system of man and other vertebrates consisting of fluid matrix, plasma and formed elements.

Plasma : The liquid part of blood or lymph which is straw coloured, viscous fluid and contains about 90-92% of water and 6-8% proteins.

Lymph : A clear yellowish, slightly alkaline, coagulable fluid, containing white blood cells in a liquid resembling blood plasma.

Hear Beat : The rhythmic contraction and relaxation of the heart, which includes one systole (contraction phase) and one diastole (relaxation phase) of the heart. Heart beat count of healthy person is 72 times per minute.

Cardiac output : The amount of blood pumped by heart per minute is called cardiac or heart output. The value of cardiac output of a normal personis about 72×70 = 5040 mL or about 5L per minute.

Electrocardiograph : (ECG) The machine used to record electrocardiogram.

Electrocardigoram ECG : The graphic record of the electric current produced by the excitation of the cardiac muscles. It is composed of a 'P' wave, 'QRS' wave (complex) and 'T' wave (Refer fig. 18.3, page 286 (for a standard ECG) (NCERT class XI - Biology)

Human Blood Corpuscles

Name and Number/ Percentage	Structure	Life Span and Formation	Function
(A) Erythrocytes RBCs - 4.5 to 5.5 million per cubic milimetre of blood	Yellow colour Circular, biconcave denucleated, elastic, lack of cell organelles like ER, ribosomes, mitochondria etc.	Formed from birth onwards by bone marrow Life - 120 days	Transport of oxygen and some amount of carbon dioxide.

(B) Leucocytes (WBCs) 5000-8000 per cubic mm of blood	Colourless, rounded or irregular, nucleated 12 to 20um wide	Formed in bone marrow, Lymph nodes spleen and thymus	Acts as soldiers scavanger and some help in healing
(i) Agranulocytes			
(a) Lymphocytes 20-45%	Large rounded nucleus	Lymph nodes, spleen, thymus bone marrow, life few days to months or even even years	Non Phagocytic secrete antibodies
(b) Monocytes 2-10%	Largest of all bean shaped nucleus	Bone marrow, lfie 10-20 hours	phagocytic, engulf germes
(ii) Granulocytes			
(a) Eosinophils 1–6%	bilobed nucleus, granules in cytoplasm	Bone marrow, life 4 to 8 hrs in blood	play role in immunity nonphagocytic
(b) Basophils 0-1%	Three lobed nucleus	Bone marrrow, life 4 to 8 hours in blood	release heparin and histamin
(c) Neutrophils 40-75%	Many lobed nucleus fine granules	Bone marrow, life 4 to 8 hours in blood	phogocytic, engulf germ and dead cells
(C) Platelets thrombocytes 1,50,000 - 3,50,000 mm^3 of blood	Colourless, rounded or oval, non nucleated fragments of cell	Bone marrow about a week	help in blood clotting

Refer fig. 18.1, page 279 (NECRT Class XI - Biology)

Lymph

The colouless mobile fluid connective tissue drains into the lymspatic capillaries from the intercellular spaces.

Composition :

It is composed of fluid matrix, plasma, white blood corpuscles or leucocytes.

Functions :

(i) It drains excess tissue fluid from extra celluar spaces back into the blood.

(ii) It contain lymphocytes and antibodies.

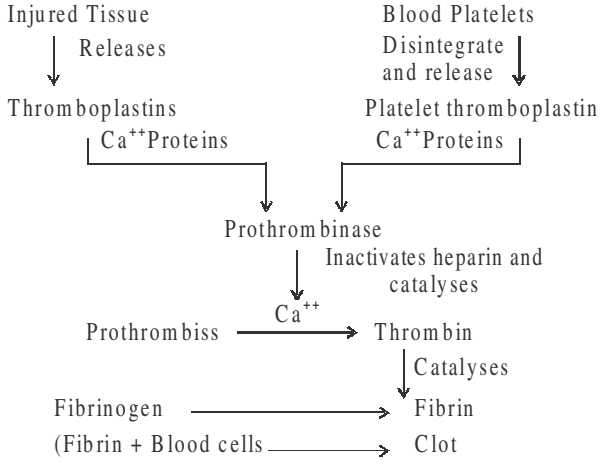
(iii) It transport digested fats.

Human Heart

It is the mesodirmally derived organ situated in thoracic cavity in between the two lungs. Protected by pericardium.

- Four chambers - two (left and right) atria, and two ventricles (left and right)
- Inner- artrial septum separates the two atria and inter ventricular septum separates th two ventricles, while the atria & ventricles are separated by atrio-ventricular septum.
- The valves between right atrium and right ventricle is tricuspid while between left atrium and ventricle is bicuspid or mitral value.
- The openings of the right and the left ventricles into the pulmonary artery and the aorta are guarded by semilunar values.
- The values allow the flow of blood only in one direction, i.e., from atria to ventricles and from ventricles to pulmonary artery or aorta.

Blood Clotting



Blood Groups

Blood Group	Antigen (on the Surface of R.B.Cs)	Anti body (In plasma)	Possible recipients having blood group	Prospective donors having blood group	Remarks
A	A	Anti B	A, AB	O, A	–
B	B	Anti A	B, AB	O, B,	–
AB	A and B	None	AB	O, A, B, AB	Universal recipients
O	None	Anti A and anti B	O, A, B, AB	O	Donor

Rh (Rhesus) System :

Discovered by Landsteiner and wiener in 1940. The antigen found on the surface of RBCs. The presence of this antigen is termed as Rh - positive (Rh^+) and its absence as (Rh^-)

→ **SAN (Sino - artrial node) :** A patch of tissues present in the right upper corner of the right atrium.

→ **AVN (Atrio Ventricular Node) :** A mass of tissues seen in the lower left corner of the right atrium close to the atrio-ventricular septum.

Heart Valves

Tricuspid Valve : The valves formed of three musclar flaps or cups, which guard the opeing between the right atrium and the right ventricle.

Bicuspid Valve (Mirtral Valve) :

The valves which guard the opeing between the left atrium and the left ventricle, made up of two flaps.

Semilunar Valves : The valves present at the opeing of the right and the left ventricles and allow the entry of blood into pulmonary artery and the aorta respectively.

Reading of ECG : 'P' Wave represents the electrical excitation **(or depolarisation)** of the atria and leads to the contraction of both the atria.

'ORS' complex : represents the depolarisation of the ventricles, which imitiates the ventricular contraction

'T' Wave : represents the return of the ventricles from excited to normal state **(repolarisation).** The end of T-wave marks the end of sytole.

Double circulation : The passage of same blood twice throught heart in order to complete one cycle. eg.

(i) The blood pumped by the right ventricle (dioxygenated blood) is trans ported through pulmonary artery to lungs where CO_2 is exchanged with O_2 through diffusion and returns back to the heart through pulmonary vein.

(ii) The oxygenated blood from left ventricle is trans ported through aorta to different body parts (cells and tissues) where O_2 is exchanged with CO_2 through deffusion and then returned back to the heart through vena-cava.

Disorders of circulatory System

Hypertension (High Blood Pressure) : It results from narrowing of arterial lumen and reduced elasticity of arterial walls in old age. It can cause rupturing of capillaries. It is a silent killer.

Coronary Artery Disease : (CAD) **Atherosclerosis** The supply of the blood to heart muscles is affected. It is caused by deposits of ca, fat, cholesterol and fibrous tissues to make the lumen of arteries narrower.

Angina Pectoris : Caused due to arteriosclerosis, when no enought oxygen is reaching the heart muscle due to which the perosn experiences acute chest paind.

Heart attack : Caused when the heart muscle is suddenly damaged by an inadequate blood supply.

Cardiac arrest : The state in which the heart stops beating.

Arteriosclerosis : The state of hardening of arteries and arterioles due to thickening of the fibrous tissue and consequent loss of elasticity. It Causes hypertension.

QUESTIONS

Very Short Answer Questions (1 mark each)

1. Name the instrument used for measuring blood pressure.
2. What is a pace-maker?
3. Why is the S.A. node called pace-maker of the heart?
4. Write the full form of S.A. node.
5. What is lymph node?
6. A cardiologist observed an enlarged QR wave in the ECG of a patient. What does it indicate?
7. Name the enzyme that catalyses the formation of carbonic acid in erythrocytes.

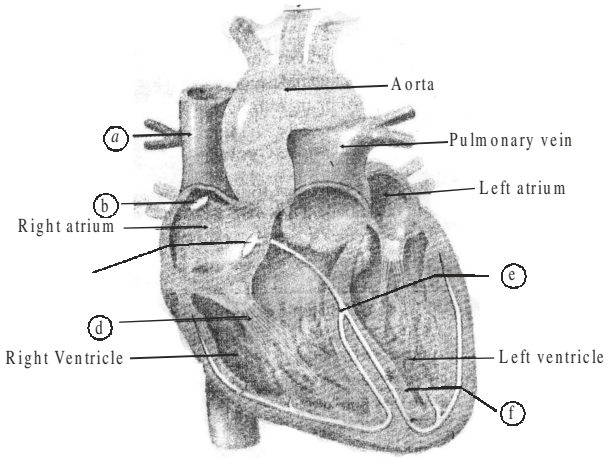
8. What is systemic circulation?
9. Give two examples of extra-cellular fluids.
10. What name is given to the blood vessels which generally bring blood to an organ?
11. Which adrenal hormone accelerates the heart beat under normal conditions.
12. Name the blood vessel that carries blood from the intestine to liver.
13. Define cardiac eycle.

Short Answer Questions-II (2 marks each)

14. Explain when and how the two sounds of heart are produced ?
15. Define joint diastole. What are the constituents of the conducting system of human heart.
16. Give the names of various types of formed elements present in the blood.

Short Answer Questions-I (3 marks each)

17. Drow a diagram showing schematic plan of blood circulation in human.
18. In the following diagram of section of a human heart label a, b, c, d, e and f.



19. What is lymph? Describe its criculation in brief.

Long Answer Questions (5 marks each)

20. Draw a diagram to show the internal structure of human heart. Lable any two heart chambers, any two heart valves and chordae tendinae in it.
21. Describe the structure of human heart.

22. What is cardiac cycle? Describe the event that occur during it.

23. Explain Rh grouping and its incompatibility in humans.

ANSWERS

Very Short Answers (1 mark)

1. Sphygmomanometer.
2. A patch of modified heart muscle that imitiates a wave of contration.
3. S.A. node being self excitatory, initiates a wave of contraction in the heart.
4. Sinu auricular node (pace-maker)
5. A lymph node is specialised structure in lymphatic vessel concerned with the filteration of foreign bodies by the lymphocytes.
6. QR wave denotes ventricular contractionof heart which may be normal or abnormal.
7. Carbonic anhydrase.
8. The kind of blood circulation that is concerned with the supply of oxygenated blood from the left ventricle to all body parts and return of oxygenated blood to the right atrium of heart.
9. Interestitial fluid and blood plasma.
10. Afferent blood vessel.
11. Noradrenalin.
12. Hepatic portal veis.
13. A regular sequence of three events (i) auricular systole (ii) ventricular systole and (iii) Joint diastole during the completion of one heart beat.

Short Answers -II (2 marks)

14. (i) 'Lubb' the first sound which is low pitched is caused by the closure of bicuspid and tricuspid valves.

    (ii) 'Dup' the second sound which is high pitched is caused by the closure of semilunar valves.

15. In a cardiac cycle when both atria and ventricles are in a diastole and are relaxed simultaneously is callled a joint diastole.

Conducting system constitutes : SA node → AV node → Bundle of His → Purkinje fibres.

16. Erythrocytes, Lymphocytes, monocytes, neutrophils, eosinophils, basophils and platelets.

Short Answers -I (3 marks)

17. Refer fig. 18.4, page 287 (NCERT - Class XI - Biology)
18. Refer fig. 18.2, page 283 (NCERT - Class XI - Biology)
19. Refer contend 18.2, page 282 (NCERT - Class XI - Biology)

Long Answer (5 marks)

20. Refer fig. 18.2, page 283 (NCERT - Class XI - Biology)
21. Refer content 18.3.1, page 283 (NCERT - Class XI - Biology)
22. Refer content 18.3.2, page 284 (NCERT - Class XI - Biology)
23. Refer content 18.1.3.2, page 281 (NCERT - Class XI - Biology)