CHAPTER - 8

THE CIRCULATORY SYSTEM

P. 106 CHECK YOUR PROGRESS 1

A. Answer these questions.

- Red blood corpuscles or erythrocytes are biconcave and enucleated (i.e. without a nucleus, young RBCs have a nucleus, but as they mature, the nucleus degenerates) disc-like biconcave shaped, flat in the centre, and thick and rounded at the periphery.
- 2. Different types of granulocytes:
 - Neutrophils
 - Basophils
 - Eosinophils

Different types of agranulocytes:

- Lymphocytes
- Monocytes (macrophages)
- 3. Blood is made up of two main components plasma (fluid part) and cellular or formed elements (blood corpuscles, solid part). Plasma is a straw-coloured aqueous solution. It forms about 55–60 per cent of the blood volume. Plasma contains water (about 90–92 per cent), inorganic salts (about 1–2 per cent) and organic compounds (about 7–8 per cent)

In human beings, the three types of cellular elements, i.e., red blood corpuscles, white blood corpuscles and platelets are solid part of blood which are found suspended in the plasma.

- 4. Blood is in a fluid state and does not clot when inside the blood vessels. Blood does not clot in uninjured vessels due to the presence of a strong, natural anticoagulant called heparin or antiprothrombin, produced in the liver. Blood usually clots after it escapes from the blood vessels.
- **5.** Persons with blood group O are called universal donors.

Persons with blood group AB are called universal recipients.

- 6. Erythroblastosis foetalis
- A mature mammalian erythrocyte lacks nucleus and mitochondria so as to make place for the accomodation of more haemoglobin and hence more oxygen molecules.

P. 115 CHECK YOUR PROGRESS 2

A. Answer these questions.

- 1. Coronary arteries supply blood to the heart muscles.
- **2.** Left side of heart, i.e., left auricle and left ventricle.
- 3. Cardiac cycle
- 4. The bicuspid valve also called the mitral valve or left auriculo-ventricular valve guards the opening of the left auricle into the left ventricle. It allows blood to pass from left auricle to the left ventricle and prevents the backflow of blood.
- 5. The circulation of blood in the human heart is called double circulation because the blood enters and leaves the heart twice in each heart beat. Circulation of blood between the heart and body organs (except lungs) is called systemic circulation. Circulation of blood between the heart and the lungs is called pulmonary circulation.
- 6. a. Pericardium b. Haemoglobin c. Serum

P. 116 Exercises

I. Multiple-Choice Questions

A. Choose the most appropriate answer.

1.	С	2. b	3. d	4. C
5.	С	6. b	7. c	8. C
9.	b	10. b	11. a	12. b
13.	b	14. c	15. a	

II. Assertion–Reason Type Questions

A.1.c 2.a 3.a 4.a

III. Very Short Answer Type Questions

A. Name the following.

- 1. Lymph2. Tricuspid valve
- 3. Calcium 4. Haemoglobin
- 5. Hepatic artery 6. Haemoglobin
- 7. Auricular systole 8. Fibrinogen
- 9. Phagocytosis 10. Ventricular systole
- 11. Pulmonary veins 12. Hepatic portal vein
- B. Arrange and rewrite the term in each group in the correct order so as to create a logical sequence beginning with the underlined term in the group.
 - 1. <u>Vena cava</u>, Right atrium, Right ventricle, Pulmonary artery

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- 2. <u>Platelet activation</u>, Formation of prothrombin activator, Conversion of prothrombin to thrombin, Conversion of fibrinogen to fibrin
- 3. Pulmonary vein, Left atrium, Left ventricle, Aorta
- C. Complete the following statements by filling in the blanks with appropriate word from the choices given in brackets.
 - **1.** hepatic portal vein **2.** 72
 - **3.** bicuspid value **4.** cardiac muscles
 - **5.** aorta **6.** phagocytosis
- D. Match the items in Column A with Column B and write down the matching pairs.
 - 1.d 2.c 3.a 4.e
 - 5. b
- E. State the exact location of the following:
 - 1. **Mitral valve:** In between left auricle and left ventricle
 - 2. Chordae tendineae: Within both ventricles of the heart
 - **3. Pulmonary semilunar valve:** Between the right ventricle and the pulmonary artery
 - 4. **Tricuspid valve:** In between right auricle and right ventricle
 - 5. Bicuspid valve: In between left auricle and left ventricle

IV. Short Answer Type Questions

A. Give suitable explanations for the following.

- 1. Ventricles have thicker walls than auricles because they have to pump blood to different organs and the pressure with which the blood flows through them is more than the auricles.
- 2. Carbon monoxide when inhaled and absorbed into the blood binds with haemoglobin and forms an irreversible complex called carboxyhaemoglobin. The formation of this complex reduces the oxygen-carrying capacity of the blood. Carboxyhaemoglobin is toxic in nature.

B. State the main function of the following.

- 1. Thrombocytes help form blood clots to slow or stop bleeding and to help wounds heal.
- **2.** Coronary arteries supply oxygenated blood to the heart muscles.
- **3.** The chordae tendinae are the chord like structures connecting atrioventricular valve leaflets to the papillary muscle. They determine

and maintain the position and tension on the valve leaflets at end of systole and prevent valves from opening in the wrong direction.

 Lymphocytes are part of the immune system. There are two main types lymphocytes, T cells and B cells. B cells produce antibody molecules that can destroy invading viruses or bacteria.

C. Answer these questions.

- 1. i. White blood cells.
 - ii. Red blood cells.
 - iii. Blood platelets.
- 2. Left atrium.
- **3.** Bicuspid valve orifice between the left atrium and left ventricle.

Tricuspid valve – orifice between the right atrium and right ventricle.

4. Left auricle receives oxygenated blood.

Left ventricle pumps oxygenated blood.

- **5.** They have thick walls to withstand the arterial blood pressure.
- **6.** Less output during circulation because less force will be generated by the thin muscular wall to be pumped to great distance.
- 7. a. Hepatic veins: From liver
 - **b.** Hepatic portal veins: from intestines, pancreas, spleen
- **8.** RBCs are biconcave, enucleated, disk-like structures.

Such a shape of RBCs is of great advantage to these cells as it increases their surface area. This small size helps in absorbing O_2 and enables them to travelling very fine blood capillaries throughout the body of a person. They lack mitochondria otherwise it would have consumed the oxygen taken in.

V. Long Answer Type Questions

A. Answer these questions.

- 1. The three events of a cardiac cycle are:
 - i. The auricular systole
 - ii. The ventricular systole
 - iii. The joint diastole

Duration of single cardiac cycle:

Complete cardiac diastole – 0.4 seconds.

Auricular systole – 0.1 second.

Ventricular systole - 0.3 seconds.

Total duration of cardiac cycle \rightarrow 0.8 seconds.

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- 2. Four types of blood groups:
 - A, B, AB, O

Please refer to table 8.2 from page 105 of textbook

3. The circulation of blood in human heart is called double circulation because the blood enters and leaves the heart twice in each heart beat. Circulation of blood between the heart and body organs (except lungs) is called systemic circulation. Circulation of blood between the heart and the lungs is called pulmonary circulation.

The four chambered heart does not allow any mixing of blood because the right auricle and right ventricle receives deoxygenated blood while the left auricle and left ventricle receive oxygenated blood.

VI. Structured/ Application/ Skill Type Question

- A. 1. A Vein (Thin muscular wall)
 - B Artery (Thick muscular wall)
 - 2. i. Endothelium
 - ii. Lumen
 - **3.** Lubb sound is caused by the vibrations set upon by the closure of tricuspid and bicuspid valves accompanied by contraction of ventricular muscles.

Dubb sound is caused by the closure of the semilunar valves and marks the end of ventricular systole.

- 4. a. Hepatic portal vein
 - **b.** Coronary arteries
- B. 1. i. Lungs
 - ii. Pulmonary artery
 - iii. Pulmonary veins
 - iv. Right ventricle
 - v. Left ventricle
 - vi. Vena cava
 - vii. Aorta
 - viii. Body parts (organ)
 - 2. To prevent the mixing of oxygenated and deoxygenated blood, the blood passes through the heart twice, once along a pulmonary circuit and then along a systemic circuit. This is called double circulation.
 - 3. Diastole means relaxation of muscles.
- C. 1. Ventricular systole

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2. Ventricles are contracted and semilunar valves are opened.

- 3. i. Pulmonary artery
 - ii. Aorta
 - iii. Pulmonary vein
 - iv. Left atrium
 - v. Bicuspid valve
 - vi. Right ventricle
- 4. i. carries deoxygenated blood
 - ii. carries oxygenated blood
- 5. Two valves i.e. AV valves are closed.
- 6. Pericardium

D. Numbers and Names:

- i. Pulmonary vein
- ii. Abdominal Aorta
- iii. Hepatic artery
- iv. Hepatic portal vein
- v. Renal artery
- vi. Renal vein
- vii. Hepatic vein
- viii. Inferior vena cava
- ix. Pulmonary artery
- 1. Hepatic vein
- 2. Hepatic portal vein
- 3. Pulmonary artery
- 4. Pulmonary vein
- E. 1. Tissue fluid (extra-cellular fluid)
 - 2. RBCs
 - 3. Lymphatic duct vessel consists of lymph.
 - i. Lymph carries carbon dioxide and nitrogenous waste material that diffuse into the blood through the tissue fluid.
 - **ii.** Lymph carries lymphocytes and antibodies from the lymph nodes to the blood as well as the fatty acids and glycerol from the intestine to the blood.
- F. 1. Veins.
 - 2. Semilunar valves.
 - **3.** Semilunar valves prevent the backward flow of blood.
 - 4. Pulmonary artery and systemic aorta.
 - 5. Top.
- G. 1. i. Pulmonary artery
 - ii. Pulmonary vein
 - iv. Renal artery
 - vi. Hepatic artery

2. Hepatic Vein (no. v)



- H. 1. The antigens of the donor's blood can react with antibodies of the recipient's blood and can cause the clumping of RBCs. This is called agglutination.
 - **2.** X AB
 - 3. Y A
 - 4. The blood from person X agglutinates when mixed with antibody a because of the presence of antigen A in the blood (since the blood group of the person X is AB, which contains both A ans B antigens).
- I. 1. b 2. e 3. a 4. d
- J. i. Ingests microorganisms
 - ii. Transports urea
 - iii. Clots blood
 - iv. Transports oxygen