The Circulatory System

REVIEW QUESTIONS

Multiple Choice Questions:

1. Put a tick mark (✓) against the correct alternative in the following statements:

(a) The only artery which carries deoxygenated blood is called,

1. Hepatic artery
2. **Pulmonary artery**
3. Aorta
4. Renal artery

(b) Pulmonary vein carries

1. **Oxygenated blood**
2. Deoxygenated blood
3. Glucose-deficient blood
4. CO_2 laden blood

(c) Function of WBCs is to

1. Transport oxygen
2. Help in clotting of blood
3. **Provide immunity**
4. Provide storage of food.

(d) Blood Capillary is a

1. Broad tube
2. Artery with thick wall
3. Vein with large lumen
4. **Narrow tube made up of endothelium only.**

(e) Nucleus is absent in

1. RBCs
2. WBCs
3. All blood cells
4. Liver cells.

(f) Sphygmomanometer measures

1. Pulse rate
2. Heart beat
3. Blood pressure
4. Brain activity

(g) The blood tastes saltish due to the presence of dissolved:

1. Sodium chloride
2. Potassium chloride
3. Ammonium nitrate
4. Sodium nitrate

Short Answer Questions:

Question 1.
1. Differentiate between the following pair of terms:
(a) Pulmonary artery and pulmonary vein.
(b) Vena cava and aorta.
(c) Platelets and WBC.
(d) RBC and WBC Ans.

Answer:

(a) Pulmonary artery and pulmonary vein.

Pulmonary artery	Pulmonary vein
1. This involves circulation of blood from the heart to the lungs.	1. This involves circulation of blood to the heart from the lungs.
2. It carries deoxygenated blood.	2. It carries oxygenated blood.

(b) Vena cava and Aorta

Vena Cava	Aorta
1. Vena Cava is a large vein.	1. Aorta is the large artery.
2. It carries deoxygenated blood from the upper and lower parts of the body i.e. head and shoulders.	2. It carries oxygenated blood to all parts of the body through its branches.

(c) Blood platelets and blood group.

Platelets	WBC
1. These are colourless, oval or round, cytoplasmic fragments	1. WBC are colourless and lack haemoglobin, larger in quantity, and have distinct oval and lobed nucleus.
2. These play a major role in blood clotting.	2. They prevent body from disease causing germs by providing immunity
3. Their life span is 3-5 days and it is called thrombocytes.	3. Their life span is short i.e. 5 to 20 days.

(d) RBC and WBC

RBC	WBC
1. They do not have nucleus at maturity.	1. They have a large characteristic nucleus.
2. They possess haemoglobin and are red.	2. They are colourless as they have no pigment.
3. They help in transport of respiratory gases.	3. They help in defence mechanism.

Question 2.
Give any three differences between an artery and a vein:
Answer:
Following are the differences between the artery and a vein:

Artery	Vein
1. Arteries carry blood from the heart to various body parts.	1. Veins carry blood from different body parts to the heart.
2. These carry oxygenated blood (except the pulmonary artery).	2. These carry deoxygenated blood (except the pulmonary vein).
3. B lood flows with h igh speed and under high pressure.	3. Blood flows with low speed and under low pressure.

Question 3.
Fill in the blanks with suitable words given below:
Answer:
a. The two lower chambers of the heart are called **ventricles.**
b. The **pulmonary** artery takes the blood from the ventricles to the lungs.
c. The blood loaded with carbon dioxide from the body comes into the **right auricle** of the heart.
d. The oxygen-rich blood from the lungs comes into the **left ventricle** of the heart.
e. The oxygen-rich blood is pumped into different parts of the body through **aorta.**
f. The carbon dioxide loaded blood from right ventricle is pumped into the lungs through **pulmonary** artery.
g. The instrument used to find out the blood pressure is known as **sphygmomanometer.**
h. The colour of a red blood cell is due to **haemoglobin.**
i. The blood plasma contains a dissolved substance called **fibrinogen.**
j. The liquid part of coagulated blood is known as **serum.**

Question 4.
In which organ of our body does blood get oxygenated?
Answer:
Blood becomes oxygenated in the lungs. The oxygenated blood is returned to left verticles by the pulmonary vein.

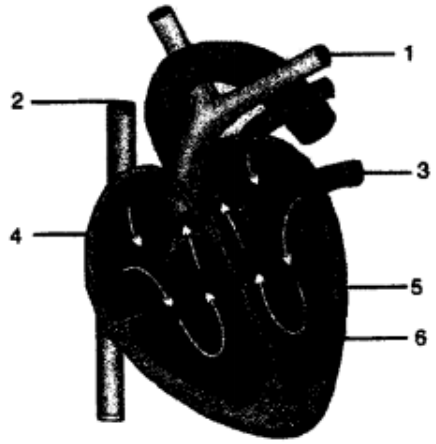
Question 5.
Which side of the heart (left or right) contains oxygenated blood?
Answer:
The left side of the heart contains oxygenated blood.

Question 6.
What is the role of haemoglobin in the blood ?
Answer:
The haemoglobin is the respiratory pigment which is formed of the iron containing part known as haemin and protein part known as globin. It helps to transport respiratory gases (oxygen).

Question 7.
Name the disease in which the number of platelets reduces to 25,000 – 30,000 per cubic mm of blood. State its major symptoms.
Answer:
Dengue fever is one such disease in which the number of platelets get reduced to as low as 25-30 thousands per cubic mm of blood. The major symptoms of dengue are high fever, rashes or red spots on body, nausea or vomiting, pain in abdomen, back, or back of the eyes and muscles.

Long Answer Questions:

Question 1.
Given alongside is a diagram of human heart showing its internal structures. Label the parts marked 1 to 6, and answer the following questions.



(a) Which type of blood is carried by the blood vessel marked 2?
(b) Name the main artery which takes the blood from heart to different parts of the body?
(c) Which chamber of the heart receives deoxygenated blood from the body?
Answer:

1. Left pulmonary artery
2. Superior vena cava
3. Left pulmonary vein
4. Right auricle
5. Left auricle
6. Left ventricle

(a) Deoxygentated blood.
(b) Aortic arch (Aorta).
(c) Right Atrium

Question 2.
You can see some blood vessels on the outside of the hands specially in older people. Are those veins or arteries ? How can you confirm your answer ?
Answer:
In older persons the skin becomes loose as the fat below becomes less with age and the vessels passing through these areas especially on the outside of the hands become prominent. These are veins as they flow superficially. The veins are thin and less muscular. These carry the blood to the heart veins are placed superficially so they are easily visible to the eye and are prominent.
The blood in the veins will be carrying CO_2 and will have many substances like sugar, amino acids, chemicals and bacteria.

Question 3.
Give the functions of lymph. Differentiate between Blood and the lymph.
Answer:
Functions of lymph are:

1. **Nutritive:** It supplies nutrition and oxygen to those parts where blood cannot reach.
2. **Drainage:** It drains away excess tissue fluid and metabolites and returns proteins to the blood from tissue spaces.
3. **Absorption:** It absorbs the fats from the intestine through lymphatics.
4. **Defence:** Lymphocytes and monocytes of the lymph function to protect the body. The lymphatics also remove bacteria from the tissues.

Difference between Blood and Lymph

Lymph	Blood
1. It contains blood plasma without blood proteins and some RBC.	1. It contains blood plasms with proteins and all three types of blood cells namely RBC, WBC and blood platelets.
2. They are light yellow in colour and does not contain RBC and haemoglobin.	2. They are red in colour due to presence of haemoglobin in RBC,
3. It doesnot carry Oxygen.	3. It carries oxygen in the body.
4. It is the part of open circulatory system.	4. It is the part of closed circulatory system.

Question 4.
Name any two heart conditions that occur commonly. Briefly explain each of them.
Answer:

1. **Palpitations:** Sometimes, one may experience the heart beating too hard or too fast or sometimes even skipping a beat. This can be frightening, but not serious or harmful and often this condition goes away on its own. Most of the time it is caused by stress or anxiety. Sometimes certain types of food may also cause palpitations.
   In rare cases, palpitations may be an indication of a more serious heart condition, specially if it is accompanied by shortness of breath, dizziness or chest pain.
2. **Hypertension:** This is a condition that occurs in a person when blood flows through the blood vessels with a force greater than normal. This is also called High Blood Pressure. Hypertension can strain the heart, damage blood vessels and increase the risk of a heart attack or stroke.

Question 5.
During surgical operations or during accidents, the patient may be given blood from outside to save his life. What is the technical name of this process ? Briefly explain the precautions to be observed and taken in this process.
Answer:
During surgical operation or an accident when excess of bleeding takes place, the patient may be given blood from outside to save his life.
The transfer of blood from the donor to the recipient is called blood transfusion.
The following precautions are taken before the blood is given to the needy person:

1. Matching of the donor's blood with that of the recipient should be done.
2. It should be made sure clinically that blood of donor is free from any infection.
3. Sterilization of all the instruments to be used during the operation is must.

Question 6.
State briefly, the difference between white blood cells and the red blood cells.
Answer:
Difference between white blood cells and the red blood cells:

RBC	WBC
1. They do not have nucleus at maturity.	1. They have a large characteristic nucleus.
2. They possess haemoglobin and are red.	2. They are colourless as they have no pigment.
3. They help in transport of respiratory gases.	3. They help in defence mechanism.
4. Life span is 120 days.	4. WBC have a short life span of 5 to 20 days.
5. They are about 5 million/mm3 of blood.	5. They are about 7000/ mm3 of blood.
6. In the embryonic stage the RBC are formed in the liver and spleen. But after birth, they are formed in the red bone marrow.	6. WBC are formed in the red bone marrow.

Question 7.

Answer very briefly, the following:

(a) Red Blood cells have no nucleus, then why do we call them cells?

(b) Why is it necessary to know The blood groups of the donor as well as the recipient ?

(c) Why should the blood going away from the stomach and intestines pass through the liver and not directly to heart?

Answer:

(a) RBC are formed in the liver and spleen when the organisjn is foetus. After birth these are formed in the red bone marrow. At the time of formation of RBC's they have nucleus but later on they loose nucleus. Those enucleated cells perform all the functions of a cell so these are called cells.

RBC's are surrounded by semipermeable plasma membrane. It contains homogenous cytoplasm and it is without the nucleus, endoplasmic reticulum, mitochondria, ribosomes and centrioles. RBC's get advantage due to this condition. Corpuscles have more space to hold haemoglobin. It can as well give more oxygen by the haemoglobin to the tissue cells. So the enucleated condition is more useful to the tissue cells. The necessity of work has made them without nucleus and perform all the functions of the cells so they are called cells.

(b) Before transfusion of blood, it is most essential to determine the blood group of the donor and the recipient. The blood group of the donor and the recipient must match with each other, otherwise the RBC's will stick to each other and thus the life of a recipient may be in danger as the blood groups are different. The sticking is due to the antigens (proteins) found in the blood of the donor and the antibodies found in the blood of the recipient.

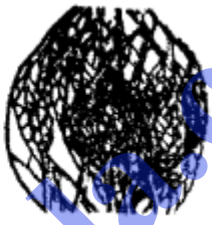
(c) The blood from the stomach and the intestine goes to liver before going to the heart. Liver monitors the substances before passing into the body. Excess of glucose is retained by the liver in the form of glycogen and the excess amino acids are broken down by the liver. Harmful chemicals are detoxified and bacteria are destroyed and excess minerals, water and vitamins are stored in the liver.

Question 8.
Name the three kinds of blood vessels found in human beings. With the help of suitable diagrams, differentiate between them.
Answer:
The three kind of blood vessels found in human beings are arteries, veins and capillaries.

1. **Arteries** are the blood vessels that carry blood from the heart to the various parts of the body.
2. **Veins** are the blood vessels that carry blood from the body parts to the heart.
3. **Capillaries:** These are the terminal branches of an artery, which rejoin to form a vein. A capillary is a very narrow tube whose walls have a single layer of cells with no muscles. Although the wall of a capillary is veiy thin, yet an exchange of nutrients, waste products and gases take place between the blood and the body fluids.


ARTERY


VEIN


CAPILLARY

Differences:

Arteries

1. Carry blood away from the heart.
2. Have thick and more muscular walls.
3. Carry oxygenated blood (except pulmonary artery which carries deoxygenated blood).
4. The blood flows with jerks and under great force.

Veins

1. Carry blood towards the heart.
2. Have thin and less muscular walls.
3. Carry deoxygenated blood (except pulmonary vein which carries oxygenated blood).
4. The blood flows smoothly and under little pressure.

Capillaries:

1. Arteries after entering an organ divide into number of smaller branches called arterioles which further divide repeatedly to form a network of fine branches called capillaries.
2. The walls of the capillaries are very thin and are one cell deep.
3. The Capillaries after the metabolic exchange unite to form larger vessels called venules, which again unite to form a vein.

ADDITIONAL QUESTIONS

I. Multiple choice questions. Tick (✓) the correct choice:

1. Human heart has

1. one auricle and one ventricle.
2. two auricles and one ventricle.
3. **two auricles and two ventricles.**
4. one auricle and two ventricles.

2. The blood vessels in which blood goes away from the heart to different body parts are

1. **arteries**
2. capillaries
3. veins
4. both arteries and veins.

3. The heartbeat is measured by an instrument called

1. thermometer
2. sphygmomanometer
3. **stethoscope**
4. none of the above

4. The blood cells which protect the body from infection are

1. RBCs
2. platelets
3. **WBCs**
4. all the above

5. The four blood groups in humans are

1. A, B, C and D

2. A, B, AB and C
3. **A, B, AB and O**
4. A, B, AB and OO

II. Fill in the blanks.

1. In human body, heart is located on the **left** side of the chest cavity.
2. The blood vessels which carry blood from the heart to different parts of the body are called **arteries.**
3. **Arteries** carry pure blood.
4. The red-coloured pigment present in RBCs is called **Haemoglobin.**
5. The fluid part of blood is called **plasma.**

III. Which of the following statements are true (T) and which ones are false (F)? Mark T or F:

1. Platelets help in clotting of blood.
   True.
2. The four blood groups in human beings are A, B, AB and AO.
   False. The four blood groups in human beings are A, B, AB and O.
3. People with blood group 'O' are called universal recipients.
   False. People with blood group 'O' are called universal donors.
4. Blood group A has antigen A.
   True.
5. Impure blood is received by the right auricle.
   True.

IV. Match the statements in Column A with those in Column B:

Column A	**Column B**
1. Heart	**(a) Movement of materials**
2. Food and oxygen	**(b) Channels for transport in man**
3. Carrier of oxygen	**(c) A living pump**
4. Circulation	**(d) Materials needed by every living being**
5. Arteries and veins	**(e) Red blood cells**

Ans. Column A	**Column B**
1. Heart	(c) A living pump
2. Food and oxygen	(d) Materials needed by every living being
3. Carrier of oxygen	(e) Red blood cells
4. Circulation	(a) Movement of materials
5. Arteries and veins	(b) Channels for transport in man

V. Describe the functions of the following:

1. Heart
2. Blood vessels
3. Red blood cells
4. White blood cells
5. Platelets
6. Blood.

Answer:

1. **Heart:** The heart is a muscular organ that pumps blood to all the cells in our body through a network of blood vessels. It pumps the blood and hence helps in circulating oxygen and nutrients to all body parts. The heart pumps deoxygenated blood to the lungs and oxygenated blood to the rest of the body.
2. **Blood vessels:** Blood vessels are a necessary part of the body's circulatory system. The blood vessels carry blood throughout the body. Three types of blood vessels are:
    1. Arteries: They carry oxygenated blood from the heart to all parts of the body.
    2. **Veins:** They carry deoxygenated blood from the body cells to the heart.
    3. **Capillaries:** They form the connection between the arteries and the veins where exchange of substances takes place.
3. **Red blood cells:** Red blood cells (RBCs) contain haemoglobin which carries oxygen throughout the body. It also transports nutrients to cells.
4. **White blood cells:** White blood cells (WBCs) help in fighting infection as they destroy the germs.
5. **Platelets:** The platelets help in clotting of blood, whenever there is a blood flow due to some injury.
6. **Blood:** Blood circulates throughout the body and performs the following functions:
    - It carries or transports food and oxygen to each body cell.
    - It carries away waste products to organs (like kidneys, lungs and intestine) from where they are excreted out of the body.
    - It protects the body against infection by destroying germs.
    - It helps in blood clotting, thereby preventing excessive blood loss.
    - It regulates body temperature.

VI. Define the following:

1. Circulatory system
2. Arteries
3. Veins

Answer:

1. Circulatory system: Circulatory system is a transport system moving substances throughout our body with the help of blood.
2. Arteries: Arteries are the blood vessels in which oxygenated blood is going away from the heart to all parts of the body.
3. Veins: Veins are the blood vessels which carry deoxygenated (impure) blood from the body cells to the heart.

VII. Answer the following questions:

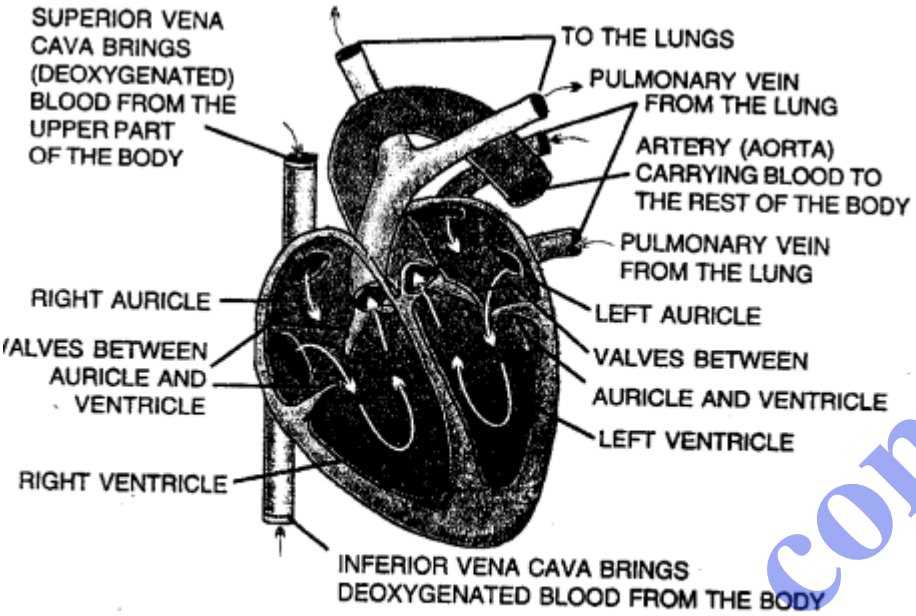
Question 1.
Name the main parts of the circulatory system.
Answer:
The main parts of the circulatory system are:

- Heart
- Blood vessels and
- Blood.

Question 2.
Name the organ from which oxygenated blood goes into the heart.
Answer:
Lungs.

Question 3.
Describe, in brief, the circulatory system in human beings.
Answer:
The circulatory system in human beings consists of heart, blood vessels (arteries, veins and capillaries) and blood. Blood circulates throughout the body in blood vessels by the pumping action of the heart. The impure blood is carried by veins from all parts of the body to the heart. The heart pumps it into the – lungs where blood is oxygenated and carried back to the heart. From heart, the oxygenated (pure) blood is pumped to all parts of the body through arteries.
Thus, the circulatory system forms the transport system carrying food, oxygen, waste products, nutrients etc. throughout the body.

Question 4.
Draw the structure of a human heart and label its parts.
Answer:



Internal structure of the human heart (Diagrammatic)

Question 5.
Why is a person having blood group AB called universal recipient and a person with blood group O called a universal donor?
Answer:
People with blood group O are called universal donors because they can donate blood to all the blood groups. Their red blood cells (RBCs) have no antigens and so cannot be stuck by blood of any other group.
People with blood group AB are called universal recipients because they can receive blood from all 4 blood groups. The red cells in them have no antibodies and therefore it does not stick with blood from other groups.

Question 6.
Name the instruments used for measuring –
(i) pulse and (ii) blood pressure.
Answer:
(i) Stethoscope. (ii) Sphygmomanometer.

Question 7.
Name the following:
(a) Components of blood
(b) Different blood groups
Answer:
(a) Components of blood are:

1. liquid part called plasma
2. The cells or corpuscles which are further of three types: (a) RBC (red blood cell), (b) WBC (white blood cell), (c) platelets.

(b) The four blood groups in humans are A, B, AB and O.

Question 8.
Differentiate between arteries and veins.
Answer:
Arteries

1. They carry blood away from the heart to all parts of the body.
2. They carry oxygenated blood (except pulmonary artery).
3. They are usually deep seated in the tissues.
4. Blood flows with jerks and under high pressure.
5. Valves are absent.
6. Thick elastic walls present.

Veins

1. They carry blood into the heart from all parts of the body.
2. They carry deoxygenated blood (except pulmonary vein).
3. They lie closer to skin surface.
4. Blood flows smoothly and under low pressure.
5. Valves are present.
6. Walls thinner than arteries present.

Question 9.
Write in brief about the following:
(a) Blood groups and (b) Blood transfusion
Answer:
(a) The four types of blood in humans are called blood groups.
These are A, B, AB and O. The blood is determined by the antigens present on the RBCs. RBCs also contain antibodies in the plasma.

Blood group	Antigen in RBCs	Antibody in plasma
A	A	Anti-B
B	B	Anti-A
AB	A and B	None
O	None	Anti-A and Anti-B

(b) Transfer of blood from one person to another is called blood transfusion. Ill or seriously injured people may need it. But compatibility of the blood groups is checked first. People with blood group AB are called universal recipients and people with blood group 0 are called universal donors.

Blood group	Can donate blood to	Can receive blood from
A	A and AB	A and O
B	B and AB	B and O
AB	AB	All groups
O	All groups	O

Question 10.
Find the odd one out, giving reason:
Answer:
(i) Arteries, capillaries, blood, veins
Ans. Blood.
Reason: Arteries, veins and capillaries are types of blood vessels whereas blood is a constituent of circulatory system.
(ii) RBC, platelets, anti-A, WBC
Ans. Anti-A.
Reason: RBC, platelets and WBC are three types of blood cells whereas anti-A is a type of antibody present in the blood plasma.

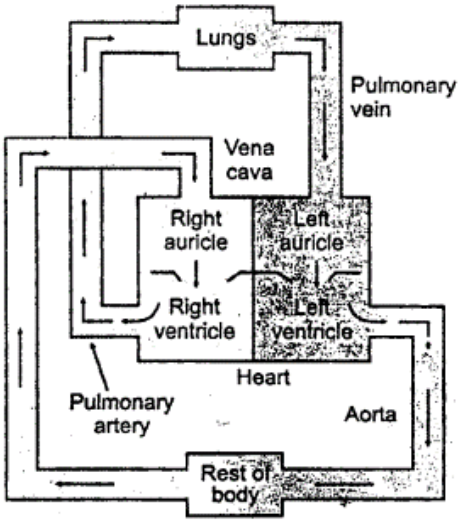
Question 11.
What is the rate of heartbeat in normal adult human being?
Answer:
70-72 per minute.

Question 12.
Name the main artery which carries blood to different parts of the body.
Answer:
Aorta.

Question 13.
What is the difference between pulmonary circulation and systemic circulation?
Answer:

Pulmonary circulation	Systemic circulation
(i) This involves circulation of blood between the heart and the lungs.	(i) This involves circulation of blood between the heart and body organs (except lungs).
(ii) It is the function of the right side of the heart.	(ii) It is the function of the left side of the heart.
(iii) It carries deoxygenated blood to the lungs to receive oxygen.	(iii) It carries oxygenated blood to the body organs.
(iv) It begins on the rightventricle and ends on left auricle.	(iv) It starts at left ventricle and ends at the right auricle.
(v) It returns oxygenated blood back to the heart.	(v) It returns deoxygenated blood back to the heart.
(vi) Blood flows as: Right ventricle ↓ deoxygenated blood Lungs ↓ oxygenated blood Left auricle	(vi) Blood flows as: Left ventricle ↓ oxygenated blood Body organs ↓ deoxygenated blood Right auricle

Question 14.
Blood in the human body circulates twice for making one complete round through the body. Explain.
Answer:
The circulation of blood through the human heart takes place twice making one complete round through the body. This is called double circulation.



Blood circulation around the body. The blood always flows in the direction shown.

The impure blood (deoxygenated blood) is collected from different body organs through two major veins (vena cava). The two veins empty blood into the right auricle. From here, it enters the right ventricle and is carried to lungs by pulmonary artery. Exchange of gases takes place in the lungs. Pulmonary vein then carries the pure (oxygenated) blood to the left auricle. From here, it enters the left ventricle and is then carried by an artery called aorta to all parts of the body. Double circulation can be summarised as:

1. Circulation of blood between the heart and the lungs is called pulmonary circulation. In this, the blood flows as follows:
   Right ventricle → lungs → left auricle (through pulmonary veins)
2. Circulation of blood between the heart and body organs (except lung) is called systemic (body) circulation. Blood flows as following:
   Left ventricle → body organs → right auricle (through vena cava)

Question 15.
How many litres of blood does an adult human body have?
Answer:
5.5 litres of blood.

Question 16.
Write a short note on human heart.
Answer:
The heart is a pump that circulates blood to all parts of the body. It is about the size of a human fist and located to the left in chest cavity. It has four chambers – two upper chambers called auricles or atria and two lower chambers called ventricles. The auricles receive blood from different body parts and ventricles pump the blood out of the heart. The valves between auricle and ventricle on each side allow blood to flow in one direction only. Heart acts as a double pump. The right side of the heart carries deoxygenated blood to the lungs to be oxygenated. The left side of the heart pump oxygenated blood to the body.

Question 17.
What are seen as greenish blue lines in our hands and legs?
Answer:
Veins.

Question 18.
Name the iron containing protein present in RBC of blood.
Answer:
Haemoglobin.

Question 19.
Define pulse.
Answer:
Pulse is the throbbing of the arteries due to the movement of blood in them.

Question 20.
Define heartbeat.
Answer:
The sound or movement of the heart as it sends blood around the body is called heartbeat. Every heartbeat causes a pulse in the arteries.

Question 21.
What is stethoscope? Explain.
Answer:
The pulse in humans can be n. ;asured by using an instrument called stethoscope. It is a de' cejhat amplifies the sound of a heartbeat and is used to sear heartbeats in the chest. It consists of three parts:

1. a chest piece, which is sensitive to heartbeats.
2. two earpieces.
3. a tube joining the chest piece and the earpieces.

Question 22.
What is a stroke? What causes it?
Answer:
A disabling attack or loss of consciousness by an interruption in the flow of blood to the brain is called a stroke. Constant high blood pressure puts a strain on the heart and can also cause an artery to burst open. If this happens in the brain, it causes stroke.

Question 23.
What is blood pressure? When does it rise?
Answer:
The pressure of the blood in the arteries caused by pumping of heart is called blood pressure. It rises if we do activities like running, cycling etc. or if the arteries become narrower.

Question 24.
What are antigens and antibodies?
Answer:
Antigens are foreign substances in the body which stimulate the production of antibodies.
Antibodies are chemical substances made by the body in response to foreign substances (antigens). They destroy antigens.