



Grade - X

Transportation in Animals

Circulatory System: The circulatory system is responsible for transport of various substances in human beings. It is composed of the heart, arteries, veins and blood capillaries. Blood plays the role of the carrier of substances.

Heart: Heart is a muscular organ; which is composed of cardiac muscles. It is so small that it can fit inside an adult's fist. The heart is a pumping organ which pumps the blood. The human heart is composed of four chambers, viz. right auricle, right ventricle, left auricle and left ventricle.

♦ Working of heart- Left side-

- (i) Left atrium relaxes & the Oxygenated blood enters it from the lungs through the pulmonary vein.
- (ii) Left atrium contracts & the blood enters the left ventricle through the valve.
- (iii) Left Ventricle contracts and the blood is pumped into the largest artery 'Aorta' and is carried to all parts of the body.

♦ Working of heart- Right side-

- (i) Right atrium relaxes & the deoxygenated blood from the body enters it through superior and inferior Vena cava.
- (ii) Right atrium contracts & the blood enters the right Ventricle through the valve.
- (iii) Right Ventricle contracts and the blood is pumped into the Pulmonary artery and is carried to lungs.

- ♦ Valves- Unidirectional to prevent the backward flow of blood.
- ♦ Pulmonary vein is the only vein that carries Oxygenated blood.
- ♦ Aorta is the only artery that carries Deoxygenated blood.
- ♦ Double circulation in man- because the blood passes through the heart twice in one complete cycle of the circulation.

- Separation of right and left side of heart allows efficient supply of oxygen to the body and useful for animals that have high energy needs to maintain their body temperature.
- In some animals, body temperature depends on the temperature in the environment and thus they do not use energy to maintain body temperature.
- Amphibians and reptiles have three chambered heart and allows some mixing of oxygen and deoxygenated blood.
- Fishes have two chambered heart and the blood is pumped to the gills for oxygenation and transported directly to all the cells of the body.
- In fish, blood goes only once through the heart and thus fish shows single circulation.

Systole: Contraction of cardiac muscles is called systole.

Diastole: Relaxation of cardiac muscles is called diastole.

Arteries: These are thick-walled blood vessels which carry oxygenated blood from the heart to different organs. Pulmonary arteries are exceptions because they carry deoxygenated blood from the heart to lungs; where oxygenation of blood takes place.

Veins: These are thin-walled blood vessels which carry deoxygenated blood from different organs to the heart. Pulmonary veins are exceptions because they carry oxygenated blood from lungs to the heart. Valves are present in veins to prevent backflow of blood.

Capillaries: These are the blood vessels which have single-celled walls.

Blood: Blood is a connective tissue which plays the role of the carrier for various substances in the body. Blood is composed of plasma, blood cells and platelets.

Blood Plasma: Blood plasma is a pale coloured liquid which is mostly composed of water. Blood plasma forms the matrix of blood.

Blood Cells: There are two types of blood cells, viz. Red Blood Cells (RBCs) and White Blood Cells (WBCs).

Red Blood Corpuscles (RBCs): These are of red colour because of the presence of haemoglobin which is a pigment. Haemoglobin readily combines with oxygen and carbon dioxide. The transport of oxygen happens through haemoglobin. Some part of carbon dioxide is also transported through haemoglobin.

White Blood Corpuscles (WBCs): These are of pale white colour. They play important role in the immunity.

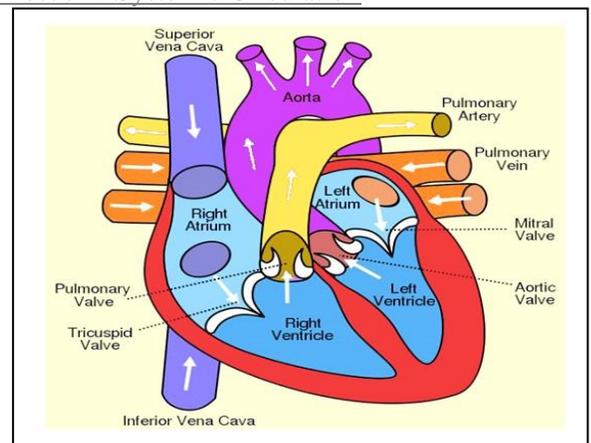
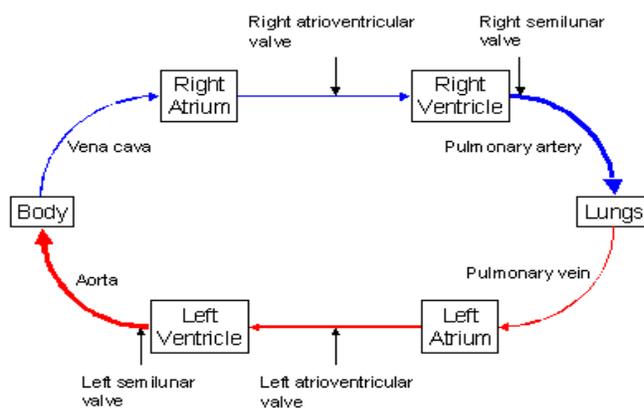
Platelets: Platelets are responsible for blood coagulation. Blood coagulation is a defense mechanism which prevents excess loss of blood; in case of an injury.

Lymph: Lymph is similar to blood but RBCs are absent in lymph. Lymph is formed from the fluid which leaks from blood capillaries and goes to the intercellular spaces in the tissues. This fluid is collected through lymph vessels and finally returns to the blood capillaries. Lymph also plays an important role in the immune system.

Double Circulation: In the human heart, blood passes through the heart twice in one cardiac cycle. This type of circulation is called double circulation. One complete heart beat in which all the chambers of the heart contract and relax once is called cardiac cycle. The heart beats about 72 times per minute in a normal adult. In one cardiac cycle, the heart pumps out 70 mL blood and thus about 4900 mL blood in a minute. Double circulation ensures complete segregation of oxygenated and deoxygenated blood which is necessary for optimum energy production in warm-blooded animals.

Circulation of Blood through the heart:

Systemic Vein \Rightarrow Sinus Venosus \Rightarrow Right Auricle \Rightarrow Right Ventricle \Rightarrow Pulmonary Artery \Rightarrow Lungs \Rightarrow Pulmonary Vein \Rightarrow Left Auricle \Rightarrow Left Ventricle \Rightarrow Truncus Arteriosus \Rightarrow Systemic Circulation



(a) Blood and lymph

	Blood		Lymph
1.	Blood is a red-coloured fluid that contains RBCs.	1.	Lymph is a colourless fluid that lacks RBCs.
2.	It contains plasma, RBCs, WBCs, and platelets. It also contains proteins.	2.	It contains plasma and lesser number of WBCs and platelets. It lacks proteins.
3.	Blood transports nutrients and oxygen from one organ to another.	3.	Lymph plays a role in the defensive system of the body. It is a part of the immune system.

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Arteries	Veins	Capillaries
From heart to rest of body	From rest of body to heart	Connects arteries and veins
Carries mostly oxygenated blood	Carries mostly deoxygenated blood	Carries both [de]oxygenated blood
High pressure with thicker walls	Low pressure with thinner walls	Walls only one-cell thick for diffusion
No valves	Has valves	No valves
Blood speed fast	Blood speed slow	

Blood pressure:

It pressure exerted by the flow of blood on the walls of the arteries. The pressure exerted when the ventricle is contracted is called systolic pressure. The pressure exerted when the ventricle is relaxed is diastolic pressure. The average systolic pressure of a healthy young man is about 120 mm Hg and the diastolic pressure is about 80 mm Hg that is, **120/80 is the normal blood pressure**. *High blood pressure is known as hypertension and low blood pressure is known as hypotension.*