

# NCERT Solutions for Class-XI Biology

## Chapter-18

1. Name the components of the formed elements in the blood and mention one major function of each of them.

1. Blood corpuscles are the formed elements in the blood, they constitute 45% of the blood. Formed elements are – (erythrocytes, RBCs or red blood corpuscles), (leucocytes, WBCs or white blood corpuscles) and thrombocytes or blood platelets. The major function of RBCs is to transport oxygen from lungs to body tissues and CO<sub>2</sub> from body tissues to the lungs. White blood cells provide immunity to the body. Blood platelets play important role in blood clotting.

2. What is the importance of plasma proteins?

2. Plasma is the colourless fluid of blood which helps in the transport of food, CO<sub>2</sub>, waste products, and salts. It constitutes about 55% of blood. About 6.8% of the plasma is constituted by proteins such as fibrinogens, globulins, and albumins. Fibrinogen is a plasma glycoprotein synthesised by the liver. It plays a role in the clotting of blood. Globulin is a major protein of the plasma. It protects the body against infecting agents. Albumin is a major protein of the plasma. It helps in maintaining the fluid volume within the vascular space.

3. Match column I with column II:

Column I		Column II	
(a)	Eosinophils	(i)	Coagulation
(b)	RBC	(ii)	Universal Recipient
(c)	AB Group	(iii)	Resist Infections
(d)	Platelets	(iv)	Contraction of Heart
(e)	Systole	(v)	Gas transport

3.

Column I		Column II	
(a)	Eosinophils	(iii)	Resist Infections
(b)	RBC	(v)	Gas transport
(c)	AB Group	(ii)	Universal Recipient
(d)	Platelets	(i)	Coagulation
(e)	Systole	(iv)	Contraction of Heart

4. Why do we consider blood as a connective tissue?

4. Connective tissues have cells scattered throughout an extra-cellular matrix. They connect different body systems. Blood is considered as a type of connective tissue because of two reasons.

- Like the other connective tissues, blood is mesodermal in origin.

- It connects the body systems, transports oxygen and nutrients to all the parts of the body, and removes the waste products. Blood has an extra-cellular matrix called plasma, with red blood cells, white blood cells, and platelets floating in it.

5. What is the difference between lymph and blood?

5. The differences between blood and lymph are given below:

<b>Lymph</b>	<b>Blood</b>
(i) Lymph is a colorless viscous fluid.	(i) Blood is red liquid connective tissue.
(ii) It flows in the lymph vessels.	(ii) It flows through blood vessels—arteries, vein and capillaries
(iii) It also contains white blood cells called lymphocytes.	(iii) It also contains hemoglobin, red blood cells, white blood cells, and platelets.
(iv) Exchange of gases and nutrients between the blood and the cells occurs through the lymph.	(iv) It transports gases and other nutrients in the body

6. What is meant by double circulation? What is its significance?

6. Double circulation is a process during which blood passes twice through the heart during one complete cycle. This type of circulation is found in amphibians, reptiles, birds, and mammals. However, it is more prominent in birds and mammals as in them the heart is completely divided into four chambers – the right atrium, the right ventricle, the left atrium, and the left ventricle.

The movement of blood in an organism is divided into two parts:

- Systemic circulation
- Pulmonary circulation

Systemic circulation involves the movement of oxygenated blood from the left ventricle of the heart to the aorta. It is then carried by blood through a network of arteries, arterioles, and capillaries to the tissues. From the tissues, the deoxygenated blood is collected by the venules, veins, and vena cava, and is emptied into the left auricle.

Pulmonary circulation involves the movement of deoxygenated blood from the right ventricle to the pulmonary artery, which then carries blood to the lungs for oxygenation. From the lungs, the oxygenated blood is carried by the pulmonary veins into the left atrium.

Hence, in double circulation, blood has to pass alternately through the lungs and the tissues.

Significance of double circulation:

The separation of oxygenated and deoxygenated blood allows a more efficient supply of oxygen to the body cells. Blood is circulated to the body tissues through systemic circulation and to the lungs through pulmonary circulation.

7. Write the differences between:

- Blood and Lymph
- Open and Closed system of circulation
- Systole and Diastole
- P-wave and T-wave

7. (a) The differences between blood and lymph are as follows:

<b>Blood</b>	<b>Lymph</b>
1. Blood is red liquid connective tissue.	1. Lymph is white tissue fluid.
2. It flows through blood vessels—arteries, veins, and capillaries and it also contains hemoglobin, red blood cells, white blood cells, and platelets.	2. It flows in the lymph vessels and also contains white blood cells called lymphocytes.
3. It transports gases and other nutrients in the body	3. Exchange of gases and nutrients between the blood and the cells occurs through the lymph

(b) The differences between Open and Closed system of circulation are:

<b>Open circulatory system</b>	<b>Closed circulatory system</b>
The blood is pumped by the heart is passed through a large vessel to the open spaces or sinuses (body cavity).	The blood vessels pumped by the heart are always circulating in the network of blood vessels.
Respiratory pigments are colorless: hemocyanins.	Respiratory pigments are red-colored: Hemoglobin
Found in mollusks and arthropods.	Found in annelids and chordates.

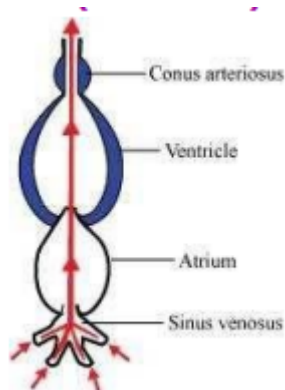
(c) The differences between Systole and Diastole are:

<b>Systole</b>	<b>Diastole</b>
It is the contraction of the heart chambers.	It is the relaxation of heart chambers.
Blood is pumped out of the chambers during systole.	Blood is received by the chambers during diastole.
It increases the blood pressure inside the heart.	The blood pressure in the heart falls.

(d) The differences between P-wave and T-wave are:

<b>P-Wave</b>	<b>T-Wave</b>
P-Wave represents the depolarisation or electrical excitation of atria.	T-Wave represents the repolarisation of ventricles.
Blood is pumped into the ventricles.	Blood is received by the atria.

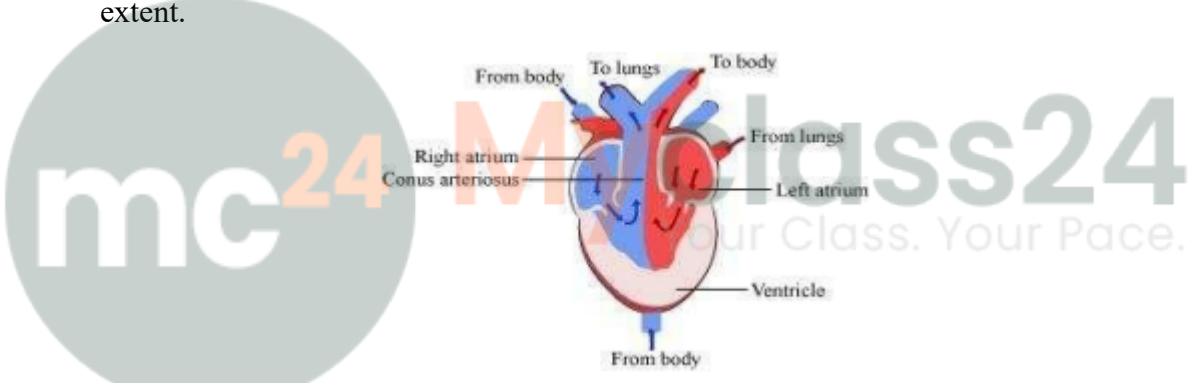
8. Describe the evolutionary change in the pattern of heart among the vertebrates.
8. All vertebrates possess a heart – a hollow muscular organ composed of cardiac muscle fibres. The function of the heart is to pump oxygen to all parts of the body. The evolution of the heart is based on the separation of oxygenated blood from deoxygenated blood for efficient oxygen transport.
- In fishes, the heart was like a hollow tube. This evolved into the four-chambered heart in mammals.
- Piscean heart**
- Fish has only two chambers in its heart – one auricle and one ventricle. Since both the auricle and the ventricle remain undivided, only deoxygenated blood passes through it. The deoxygenated blood enters the gills for oxygenation from the ventricle. It has additional chambers such as sinus venosus and conus arteriosus.



### Amphibian heart

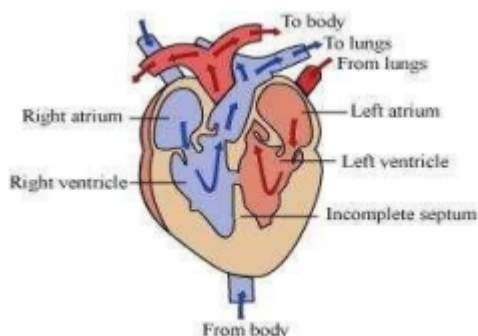
Amphibians, such as frogs, have three-chambered hearts, with two auricles and one ventricle. The auricle is divided into a right and a left chamber by an inter-auricular septum, while the ventricle remains undivided.

Additional chambers such as sinus venosus and conus arteriosus are also present. The oxygenated blood from the lungs enters the left auricle and simultaneously, the deoxygenated blood from the body enters the right auricle. Both these auricles empty into the ventricle, wherein the oxygenated and deoxygenated blood get mixed to some extent.



### Reptilian heart

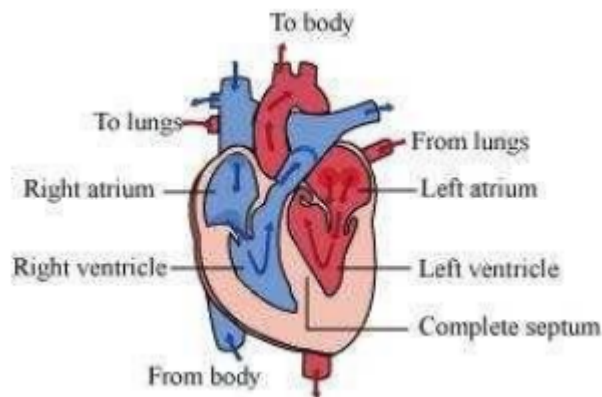
Reptiles have incomplete four-chambered hearts, except for crocodiles, alligators, and gharials. They have only one accessory chamber called sinus venosus. The reptilian heart also shows mixed blood circulation.



### Avian and mammalian hearts

They have two pairs of chambers for separating oxygenated and deoxygenated bloods. The heart is divided into four chambers. The upper two chambers are called atria and the lower two chambers are called ventricles. The chambers are separated by a muscular

wall that prevents the mixing of the blood rich in oxygen with the blood rich in carbon dioxide.



9. Why do we call our heart myogenic?
9. The heart of molluscs and vertebrates including humans is myogenic. It means heart beat is initiated in heart itself by a patch of modified heart muscle called sino-atrial node or pacemaker which lies in the wall of the right atrium near the opening of the superior vena cava.
10. Sino-atrial node is called the pacemaker of our heart. Why?
10. The sino-atrial (SA) node is a specialised bundle of neurons located in the upper part of the right atrium of the heart. The cardiac impulse originating from the SA node triggers a sequence of electrical events in the heart, thereby controlling the sequence of muscle contraction that pumps blood out of the heart. Since the SA node initiates and maintains the rhythmicity of the heart, it is known as the natural pacemaker of the human body.
11. What is the significance of atrio-ventricular node and atrio-ventricular bundle in the functioning of heart?
11. Atrio-ventricular node (AVN) is a mass of neuromuscular tissue, which is situated in wall of. right atrium, near the base of inter-atrial septum. AV node is the pacesetter of the heart,- as it transmits the impulses initiated by SA node to all parts of ventricles. Atrio-ventricular bundle (A-V bundle) or bundle of His is a mass of specialised fibres which originates from the AVN. Within the myocardium of the ventricles the branches of bundle of His divide into a network of fine fibres called Purkinje fibres. The bundle of His and the Purkinje fibres convey impulse of contraction from the AVN to the myocardium of the ventricles.
12. Define a cardiac cycle and the cardiac output.
12. Cardiac cycle is defined as the complete cycle of events in the heart from the beginning of one heart beat to the beginning of the next. It comprises three stages – atrial systole, ventricular systole, and complete cardiac diastole.  
Cardiac output is defined as the amount of blood pumped out by the ventricles in a minute.

13. Explain heart sounds.

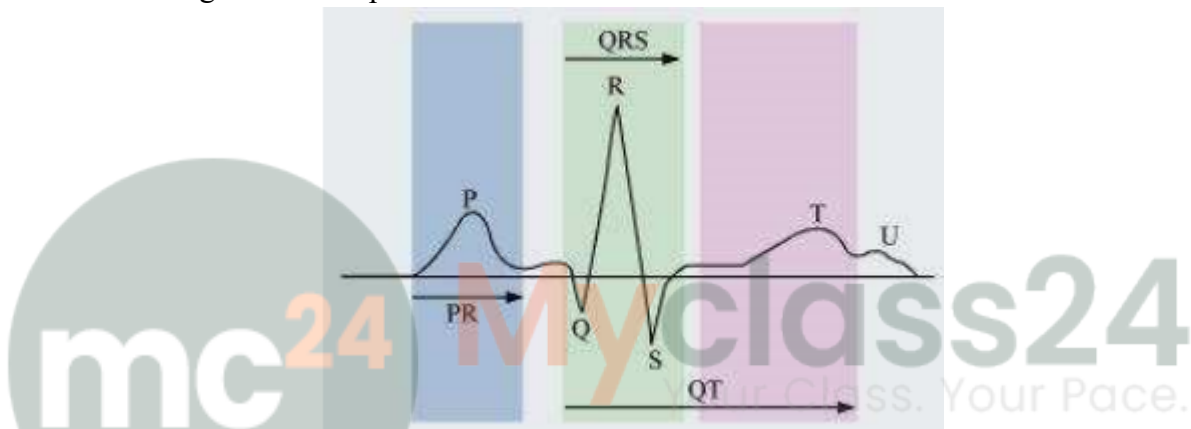
13. The beating of heart produces characteristic sounds which can be heard by using stethoscope. In a normal person, two sounds are produced per heart beat. The first heart sound 'Lubb' is low pitched, not very loud and of long duration. It is caused partly by the closure of the bicuspid and tricuspid valves and partly by the contraction of muscles in the ventricles.

The second heart sound 'dubb' is high pitched, louder, sharper and shorter in duration. It is caused by the closure of the semilunar valves and marks the end of ventricular systole.

14. Draw a standard ECG and explain the different segments in it.

14. Electrocardiogram is a graphical representation of the cardiac cycle produced by an electrograph.

The diagrammatic representation of a standard ECG is shown below.



A typical human electrocardiogram has five waves – P, Q, R, S, and T. The P, R, and T waves are above the base line and are known as positive waves. The Q and S waves are below the base line and are known as negative waves. The P-wave is of atrial origin, while the Q, R, S, and T-waves are of ventricular origin.

(a) The P-wave indicates atrial depolarisation. During this wave, the impulse of contraction is generated by the SA node. The PQ-wave represents atrial contraction.

(b) The QR-wave is preceded by ventricular contraction. It represents the spread of the impulse of contraction from the AV node to the wall of the ventricle. It leads to ventricular depolarisation.

(c) The RS-wave represents ventricular contraction of about 0.3 sec.

(d) The ST-wave represents ventricular relaxation of about 0.4 sec. During this phase, the ventricles relax and return to their normal state.

(e) The T-wave represents ventricular relaxation.