CBSE NCERT Solutions for Class 11 biology Chapter 18

Exercises

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

Solution: The components of the formed elements in the blood include:

- Erythrocytes – It is also known as red blood cells (RBC). It functions in the transportation of respiratory gases in the body.
- Leucocytes – It is also known as White blood cells (WBC). It is classified into granulocytes and agranulocytes.
  Granulocytes are Neutrophils, Eosinophils, and Basophils.
  Agranulocytes are monocytes and lymphocytes.
  Neutrophils and Monocytes are phagocytic in function. Basophils are involved in inflammatory functions. Eosinophils counter allergic reactions and lymphocytes are involved in immune response.
- Platelets - They are also known as thrombocytes. They are involved in coagulation or blood clotting mechanisms.

Q.2. Sino-atrial node is called the pacemaker of our heart. Why?

Solution: Sino-atrial node (SAN) is called the pacemaker of our heart because it is auto excitable and generates the action potential impulses for the heart to start its contraction and maintain its rhythmic contractibility.

Q.3. What is the significance of atrio-ventricular node and atrio-ventricular bundle in the functioning of heart?

Solution: The atrio-ventricular node and atrio-ventricular bundle function in conduction of electrical impulses in the heart. It is present in the lower-left corner of the right atrium and close to the atrio-ventricular septum and made of nodal tissue.

The atrio-ventricular node conducts the electrical impulse received from the SA node and it is passed on to the atrio-ventricular bundle also called as AV bundle or Bundle of His, which branches out into tiny fibres called Purkinje fibres that are present throughout the ventricular musculature. Purkinje fibres helps in electrical conduction and spreading of impulses for the ventricular contraction.

Q.4. Define a cardiac cycle and the cardiac output.

Solution: Cardiac cycle:
The sequential event in the heart which is cyclically repeated is called the cardiac cycle and it consists of systole and diastole of both the atria and ventricles. The heart beats 72 times per minute, i.e., that many cardiac cycles are performed per minute. From this, it could be deduced that the duration of a cardiac cycle is 0.8 seconds.

Cardiac output:
Cardiac output is the stroke volume multiplied by heart rate.i.e.
Cardiac output = Stroke volume * heart rate
Where, Stroke volume is the volume of blood pumped by the ventricles during each cardiac cycle. The ventricles pump approximately 70ml of blood during each cardiac cycle.
Heart rate is the no. of heartbeats per minute. The heart rate is 72 beats per minutes.
Hence, in a healthy individual, the cardiac output on an average is 5000 ml or 5L.

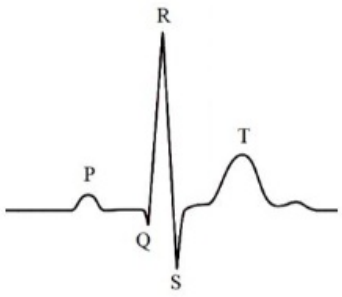
Q.5. Explain heart sounds.

Solution: There are two prominent heart sounds produced during every cardiac cycle. The sounds are Lub (first heart sound) and Dub (second heart sound).

- The sound ‘Lub’ is the first sound and is low-pitched. It is produced when the bicuspid and tricuspid valves present between the auricle and ventricle of the right and left side of the heart respectively.
- The sound 'Dub' is produced when the semilunar valves of large veins i.e. the inferior vena cava and superior vena cava close.

Q.6. Draw a standard ECG and explain the different segments in it.

Solution: ECG is used to represent the electrical activity of the heart graphically during a cardiac cycle.
A standard ECG wave can be studied as follows:



Standard ECG

The P- wave of the ECG represents the electric depolarisation of atria, i.e. it refers to the contraction of atria.

The QRS complex represents the electric depolarisation of the ventricles, i.e. it refers to the contraction of ventricles, which indicates the beginning of systole.
The T-wave represents the electric repolarisation of the ventricles, i.e. it refers to the relaxation of the ventricles. The end of T-wave indicates the end of systole.

The count of the number of QRS complex peaks for a minute helps in determining the heartbeat rate of an individual. The peaks of the ECG is usually of the same shape in the individuals and any deviation in it could be an indication of abnormalities in the heart. Hence, ECG has a clinical significance.

Q.7. What is the importance of plasma proteins?

Solution: Plasma is a viscous, straw-colored fluid which comprises almost 55% of the blood. The major proteins in the blood are Fibrinogen, globulins and albumins.

- Fibrinogen is involved in coagulation of blood.
- Albumin is required for the osmotic balance.
- Globulin is involved in the defense mechanism of the body.

Q.8. 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

Solution:

	Column I		Column II
(a)	Eosinophils	(iii)	Resist Infections

Eosinophils help in fighting inflammatory reactions and parasitic infections.

	Column I		Column II
(b)	RBC	(v)	Gas transport

The haemoglobin present in the red blood cells helps in the transport of gases.

	Column I		Column II
(c)	AB Group	(ii)	Universal recipient

The cells of blood group AB do not possess antibodies in plasma, thus this blood can be donated to any of the individuals as it does not stimulate the immune system in their body.

	Column I		Column II
(d)	Platelets	(i)	Coagulation

Platelets also called thrombocytes help in the clotting of blood.

	Column I		Column II
(e)	Systole	(iv)	Contraction of Heart

Systole is the phase of cardiac cycle in which the chambers or compartments of heart contract.

	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

Q.9. Why do we consider blood as a connective tissue?

Solution: Blood is a fluid connective tissue formed from the mesoderm layer of an embryo. It is a connective tissue in the form of fluid and consists of the fluid matrix, plasma and the formed elements. It has many roles which include the transport of respiratory gases. It also binds and links the different body parts, transport the nutrients, hormones and the waste material to the kidneys. Since it acts as a connecting link between different body parts, it is called as a connective tissue.

Q.10. What is the difference between lymph and blood?

Solution:

Feature	Lymph	Blood
Colour	It is a colourless fluid that contains specialised lymphocytes for immune responses in the body.	It is a red coloured fluid due to presence of haemoglobin that contains plasma, fluid matrix and formed elements.

Feature	Lymph	Blood
Type of vessels and speed of flow	Lymphatic vessels carry lymph and the speed of its flow is slow.	Arteries, veins, and capillaries carry blood. The rate of flow is high.

Feature	Lymph	Blood
Function	Maintaining the composition of tissue fluid and the volume of blood. Thus, it is called as 'middle man' of the body.	Blood transports gases and other nutrients to the body.

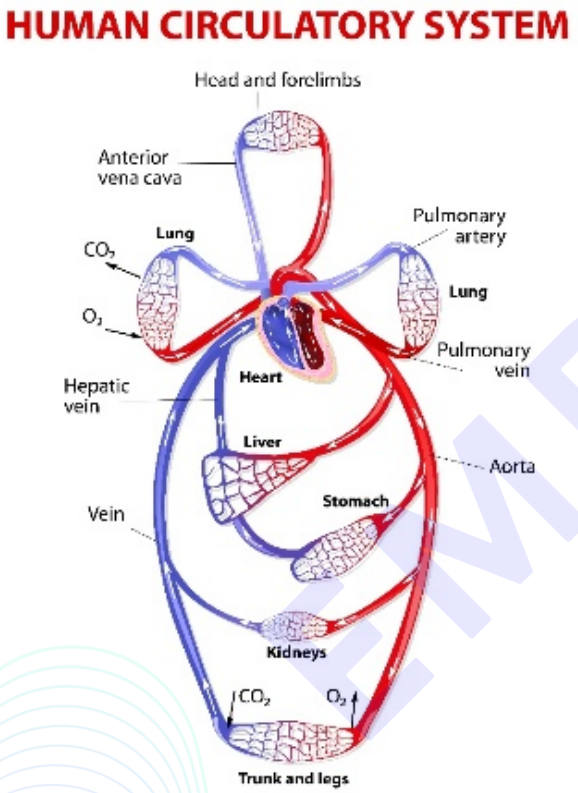
Q.11. What is meant by double circulation? What is its significance?

Solution:

In human beings, the blood enters the heart twice within a single cycle and this type of circulation is called **double circulation**. In double circulation, the pulmonary artery carries the deoxygenated blood from the right ventricle and the exchange of gases takes place in the lungs after which the oxygenated blood enters the heart through the pulmonary veins into the left auricle. This circulation is called as the **pulmonary** circulation.

The oxygenated blood is carried by the aorta to various parts of the body through the network of arteries, arterioles and capillaries into various tissues. The venules, veins i.e superior, inferior vena cava carry deoxygenated blood and transfer it into the right auricle of the heart. While oxygen and various nutrients are provided to the tissues and the carbon dioxide is taken away from the tissues through the blood. This is known as **systemic circulation**.

This type of blood circulation helps in maintaining body temperature, prevents mixing of oxygenated and deoxygenated blood and increases the efficiency of the circulatory system.



Q.12. Write the differences between blood and lymph.

Solution:

Feature	Lymph	Blood
Colour	It is a colourless slightly alkaline body fluid that contains specialised lymphocytes for immune responses in the body.	It is a red coloured fluid due to presence of haemoglobin and contains plasma, fluid matrix and formed elements.

Feature	Lymph	Blood
Type of vessels and speed of flow	Lymphatic vessels carry lymph and the speed of its flow is slow.	Arteries, veins and capillaries carry blood. The rate of flow is high.

Feature	Lymph	Blood
Function	Maintaining the composition of tissue fluid and the volume of blood. Thus, it is called as 'middle man' of the body.	Blood transports oxygen from the lungs and other nutrients to the cells of the body.

Q.13. Write the differences between:

(b) Open and Closed system of circulation

Solution:

Feature	Open system of circulation	Closed system of circulation
Path of transport	The blood pumped by the heart pass through large blood vessels and enters body cavities called sinuses.	The blood pumped by the heart is circulated through a closed network of blood vessels.

Feature	Open system of circulation	Closed system of circulation
Example	It is observed in molluscs and arthropods.	It is observed in annelids and chordates.

Feature	Open system of circulation	Closed system of circulation
Efficiency	It is a less efficient mode of circulation.	It is a highly efficient mode of circulation.

Q.14. Write the differences between:

(c) Systole and Diastole

Solution:

Feature	Systole	Diastole
Action of heart	The contraction of auricles and the ventricles is called systole.	The relaxation of auricles and ventricles is called diastole.

Feature	Systole	Diastole
Blood Volume	During systole, the volume of the chambers of heart decrease and pushes blood out of them.	During diastole, the chambers of the heart are in actual size to receive the blood.

Q.15. Write the differences between:

(d) P-wave and T-wave

Solution:

Feature	P Wave	T Wave
State of Polarisation	It represents the electrical depolarization or excitation of the atria.	It represents the repolarization of ventricles.

Feature	P Wave	T Wave
Effects	It causes contraction of both the atrium leading to the pumping of blood into ventricles.	It causes the relaxation of the ventricles which enable them to go back to normal size.

Q.16. Describe the evolutionary change in the pattern of heart among the vertebrates.

Solution:

The muscular chambered heart is present in all the vertebrates. A fish has two-chambered heart, i.e. it has an auricle and a ventricle. It has a single circulation, where the gills oxygenate the deoxygenated blood pumped by the heart. It is then circulated to all the body parts from where the deoxygenated blood returns to the heart.

In amphibians and reptiles (excluding crocodiles), the three-chambered heart is present, which consist of two auricles and one ventricle. Incomplete double circulation is observed in these animals. The right auricle receives deoxygenated blood from all parts of the body and the left auricle receives oxygenated blood from lungs or skin or gills and the blood from both the auricles enter the single ventricle which pumps out mixed blood.

Birds, crocodiles and mammals possess four-chambered heart which consists of two auricles and two ventricles. In birds and mammals, the blood from the right auricle enters right ventricle and from the left auricle to the left ventricle, hence there is no mixing of blood. Hence, they have double circulation which is the most efficient among all these types.

Q.17. Why do we call our heart myogenic?

Solution: The contractions in the heart are controlled by specialized tissue in the heart i.e. the nodal tissue present in the heart wall. It consists of different parts, the Sinu-auricular node, Auriculo-ventricular node, Bundle of His and Purkinje fibers that spread all around the heart. There are specialized cardiac muscles having intercalated discs between them that are meant for the faster conduction of impulses. The human heart has the capability to initiate its own contraction thus, it is considered as myogenic.